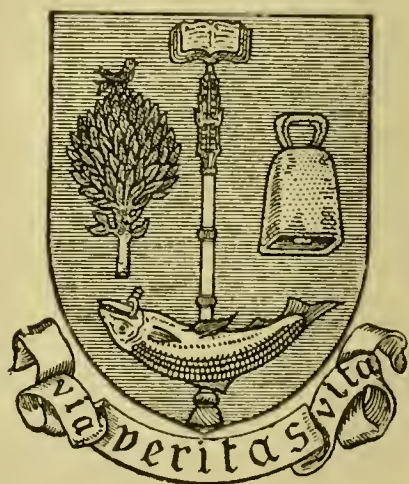




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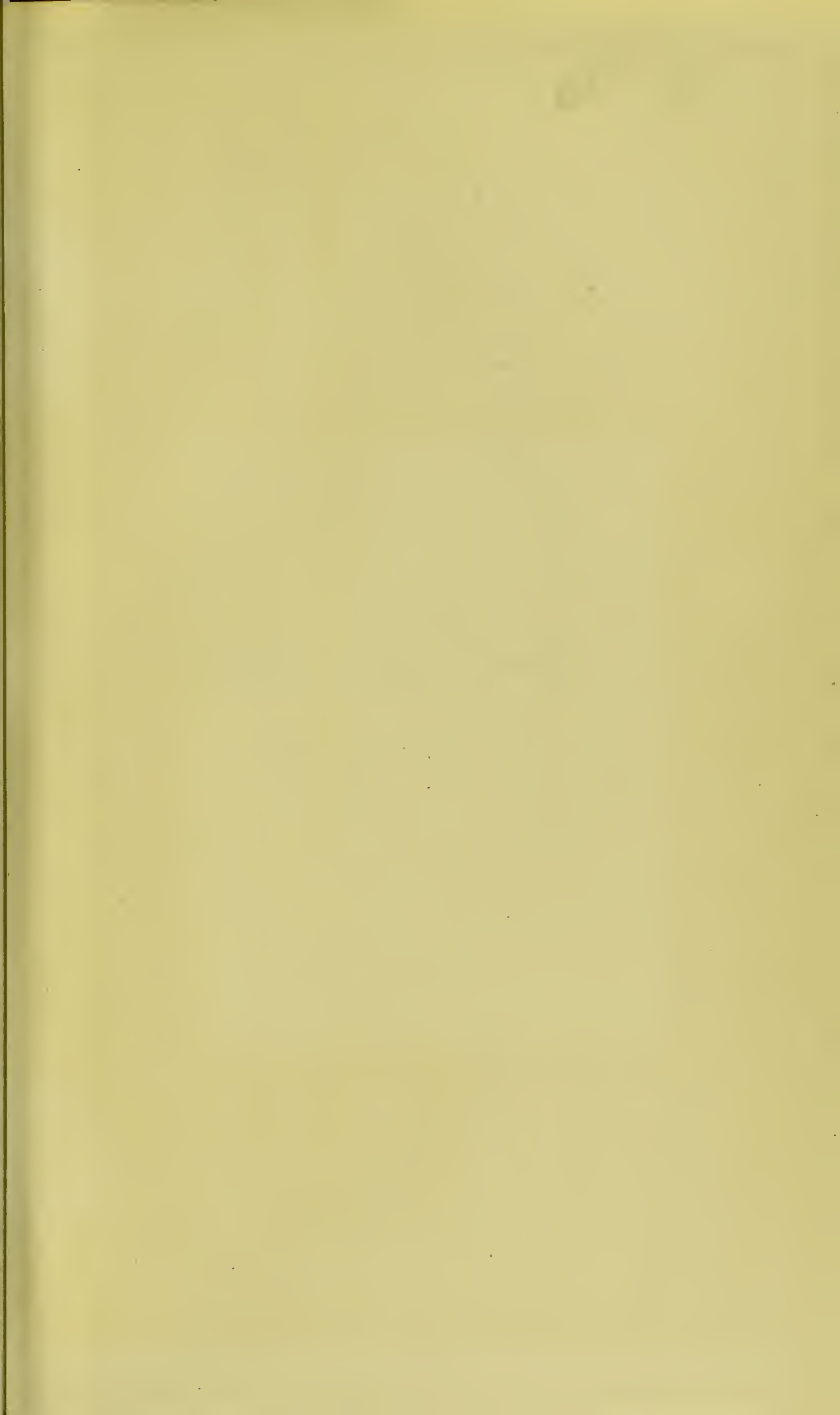
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A MANUAL OF MIDWIFERY

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MCMXII.

# A MANUAL OF MIDWIFERY

FOR STUDENTS AND PRACTITIONERS

BY

G. BALFOUR MARSHALL

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GLASGOW

*WITH 9 COLOURED PLATES AND 125 ILLUSTRATIONS  
IN THE TEXT*

GLASGOW  
JAMES MACLEHOSE AND SONS

Publishers to the University

1912



TO  
MURDOCH CAMERON, M.D., F.R.F.P.S.G.,  
REGIUS PROFESSOR OF MIDWIFERY  
IN THE UNIVERSITY OF GLASGOW,  
WHO BY HIS SUCCESSFUL OPERATIVE WORK, ESPECIALLY AS REGARDS  
CAESAREAN SECTION, HAS DONE SO MUCH TO ESTABLISH THE  
REPUTATION OF THE GLASGOW SCHOOL OF MIDWIFERY  
AND WHO BY HIS EFFORTS HAS HELPED TO MAKE  
THE GLASGOW MATERNITY HOSPITAL WHAT IT  
NOW IS, THIS BOOK IS RESPECTFULLY  
DEDICATED BY THE AUTHOR.





## PREFACE.

It has been my custom to issue full notes and diagrams to the students attending my classes, and I have been repeatedly asked to publish these in book form.

The present manual is the outcome of these requests, and covers the ground occupied by a course of one hundred lectures.

In view of the purpose for which the book has been written, no authorities, with one or two exceptions, are quoted, while subjects which are of every-day importance receive much fuller consideration than others less frequently met with in general practice. For these rarer conditions in obstetrical practice, the reader is referred to the many excellent large text-books on the subject.

The illustrations from which the publishers have prepared the blocks have been drawn by myself.

I am indebted to Dr. Fothergill for permission to copy his coloured diagram on development of the ovum, and to Dr. Duff for providing a suggestive sketch from which I made the pen and ink diagrams on the development of the human ovum.

My thanks are also due to Dr. W. D. Macfarlane for reading the final proofs, and to the publishers for the courteous manner in which they have carried out my wishes.

THE AUTHOR.

GLASGOW, *November*, 1911.



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## PART I.

### THE PELVIS FROM THE OBSTETRIC STANDPOINT.

#### Bony Pelvis.

##### 1. Divisions of Pelvis.

THE *Bony Pelvis* from the obstetric standpoint is divided into *False* and *True Pelvis*.

In the *True Pelvis* we recognise the *Brim* and *Outlet*: all that portion lying between being called the *Cavity*.

The *False Pelvis* is all that portion above the brim. The *True Pelvis* is all that portion lying below the brim.

The *Brim*, "*superior strait*" or "*pelvic inlet*" is a heart-shaped plane, bounded by the sacral promontory, iliopectineal lines or lineae terminales and upper border of the symphysis pubis.

The *Outlet*, "*inferior strait*" or "*pelvic outlet*," is a lozenge or ellipsoid plane flattened in the transverse, and is bounded by the tip of the coccyx, the sacro-sciatic ligaments, ischial tuberosities, lower edges of the rami of ischium and pubis, and the lower border of the symphysis pubis.

The *Cavity*, (a) *Wide part* is the plane bounded by the junction of the second and third sacral vertebrae, midpoint inner surfaces of the acetabula and middle of the symphysis pubis.

(b) *Narrow part or strait* is the plane bounded by the tip of the sacrum, the ischial spines and the lower edge of the symphysis pubis.

A *slight ridge* runs downwards and backwards from the iliopectineal eminence to the ischial spine dividing the side wall

## 2 THE PELVIS FROM THE OBSTETRIC STANDPOINT

of the cavity into the “*anterior and posterior inclined planes.*” Normally these have no influence on head rotation during labour.

### 2. Diameters of Pelvis.

The following measurements give the average size as found in Anglo-Saxons. The shape of the pelvis varies in different races, and is roomiest amongst Europeans, women of European origin, Chinese and Japanese.

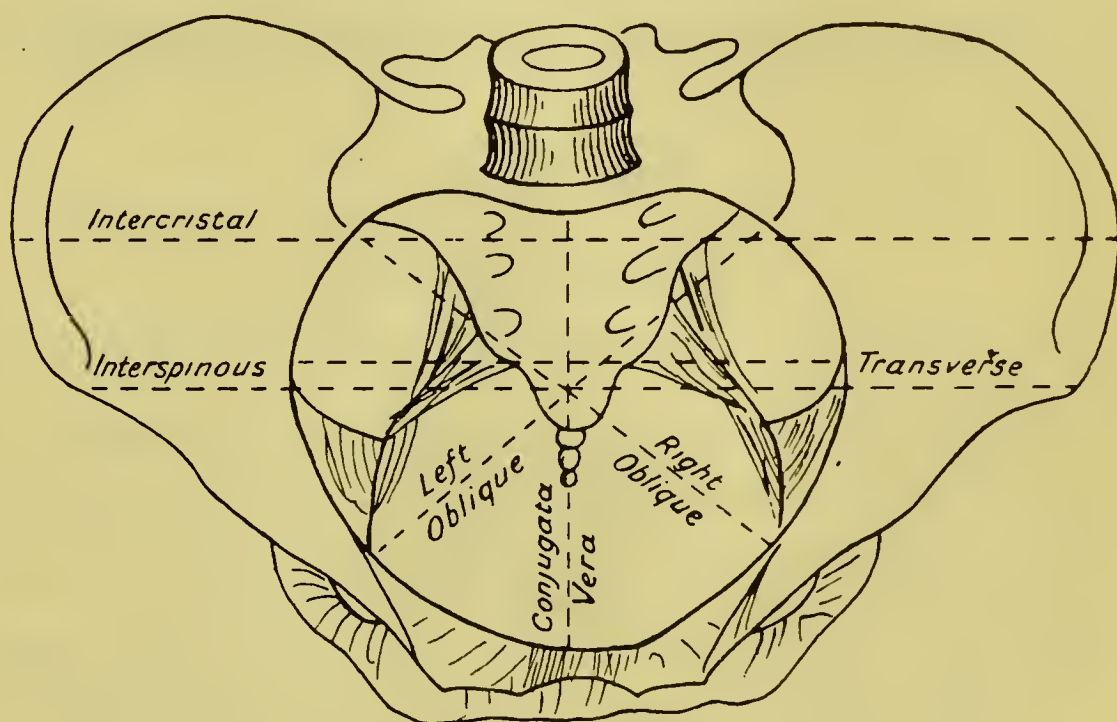


FIG. 1.—DIAMETERS OF BONY PELVIS.

#### A. EXTERNAL (Figs. 1 and 2).

- |  |                                    |
|--|------------------------------------|
| (a) <i>Interspinous</i> , between the anterior superior spines, - - - - -  | 10 $\frac{1}{4}$ ins. <sup>1</sup> |
| (b) <i>Intercristal</i> , between the widest parts of the iliac crests, - - - - -  | 11 ins. <sup>1</sup>               |
| (c) <i>External conjugate</i> (Baudelocque's), from the tip of the last lumbar spine to the upper edge of the symphysis pubis, - | 8 ins. <sup>1</sup>                |
| (d) <i>Intertrochanteric</i> , between the great trochanters, - - - - -  | 13 ins. <sup>1</sup>               |

#### B. INTERNAL (Figs. 1 and 2).

- (a) *Conjugata vera*, from the middle of the sacral promontory to the upper border of the symphysis pubis.

<sup>1</sup>These measurements were suggested for American adoption in 1905.

- (b) *Right and (left) oblique*, from the right (left) sacro-iliac joint to the opposite ilio-pectineal eminence.
- (c) *Transverse*, between the widest parts of the ilio-pectineal lines.
- (d) *Diagonal or oblique conjugate*, from the middle of the sacral promontory to the *lower* border of the symphysis pubis.

		Conjugate,	Oblique,	Transverse,	Diag. Conj.
Brim,	- -	$4\frac{1}{2}$	5	$5\frac{1}{4}$	5
Cavity,	- -	$5\frac{1}{4}$	$5\frac{1}{4}$	5	
Outlet,	- -	5	$4\frac{3}{4}$	$4\frac{3}{4}$	
		(Dakin, etc.)		(American). <sup>1</sup>	
Brim,	- -	4	$4\frac{1}{2}$	5	$4\frac{1}{4}$ 5 $5\frac{1}{4}$
Cavity,	- -	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	— — —
Outlet,	- -	5	$4\frac{1}{2}$	4	$3\frac{3}{4}$ $4\frac{1}{4}$ <sup>2</sup> — $4\frac{1}{4}$

It will be noted that the roomiest diameters of the pelvis are

- (a) the transverse at the brim,  
 (b) the obliques in the cavity,  
 (c) the conjugate at the outlet.

During labour, however, the child's head finds more room in the oblique than in the available transverse of the brim. The true transverse, although the widest part of the brim, lies considerably posterior to the axis of the pelvis (Fig. 1).

### C. VERTICAL (depth).

- (a) *Symphysis pubis*, - - - - - 2 ins.<sup>1</sup>  
 (b) *Side wall*, brim to ischial tuberosities, -  $3\frac{1}{2}$  ins.  
 (c) *Posterior wall*, from the middle of the  
 sacral promontory to the tip of the  
 extended coccyx in a straight line, - 5 ins.<sup>2</sup>

The *plane of the brim* (in the erect attitude) is at an angle of  $50^{\circ}$  to  $60^{\circ}$  to the horizon (Fig. 2); the *plane of the outlet* at  $11^{\circ}$ .

The *tip of the coccyx* is about  $\frac{1}{2}$  inch *above the lower border* of the symphysis pubis. The *sacral promontory* is about  $3\frac{1}{2}$ –4 inches above the symphysis pubis. In order to get the proper inclination of the pelvis hold it with its anterior superior spines and pubic spines in the same perpendicular plane, *e.g.* by placing it against a wall (Fig. 2).

<sup>1</sup> These measurements were suggested for American adoption in 1905.

<sup>2</sup> With coccyx pushed back.



#### 4 THE PELVIS FROM THE OBSTETRIC STANDPOINT

*Axis of Brim.*—This is a perpendicular line bisecting the conjugate of the brim, represented by a line drawn from the umbilicus to about the tip of the coccyx.

*Axis of Outlet.*—This is a perpendicular line bisecting the conjugate of the outlet. It is a line drawn from about the middle of the first sacral vertebra to midway between the ischial tuberosities.

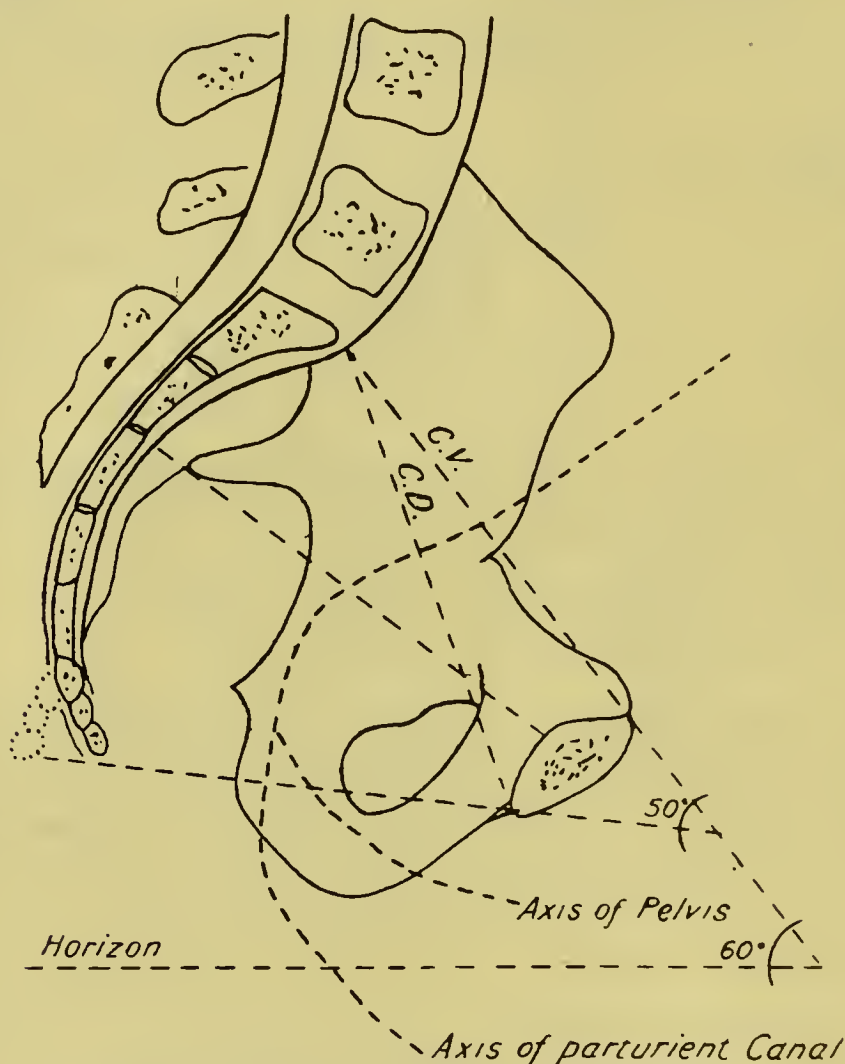


FIG. 2.—SECTION OF BONY PELVIS SHOWING THE ANTERO-POSTERIOR DIAMETERS AND PELVIC AXIS; ALSO THE PELVIC INCLINATION TO THE HORIZON.

C.V. Conjugata Vera.

C.D. Diagonal Conjugate.

*Axis of Pelvis* (Fig. 2).—This is a continuous curve formed by joining the bisections of all the conjugates of the true pelvis. It is only of historical interest, as it was formerly believed that this was the course the foetal head took in its passage through the pelvis during delivery.

#### 3. Difference between Male and Female Pelvis.

The female pelvis is wider, smoother, shallower and lighter in structure. The iliac bones are more expanded. There is less



projection of the sacral promontory. The brim is roomier and more oval, the transverse being wider. The sacrum is broader and more curved. The pubic arch is wide, showing an angle of  $90^{\circ}$ – $100^{\circ}$  compared to  $70^{\circ}$ – $75^{\circ}$  in the male. The obturator

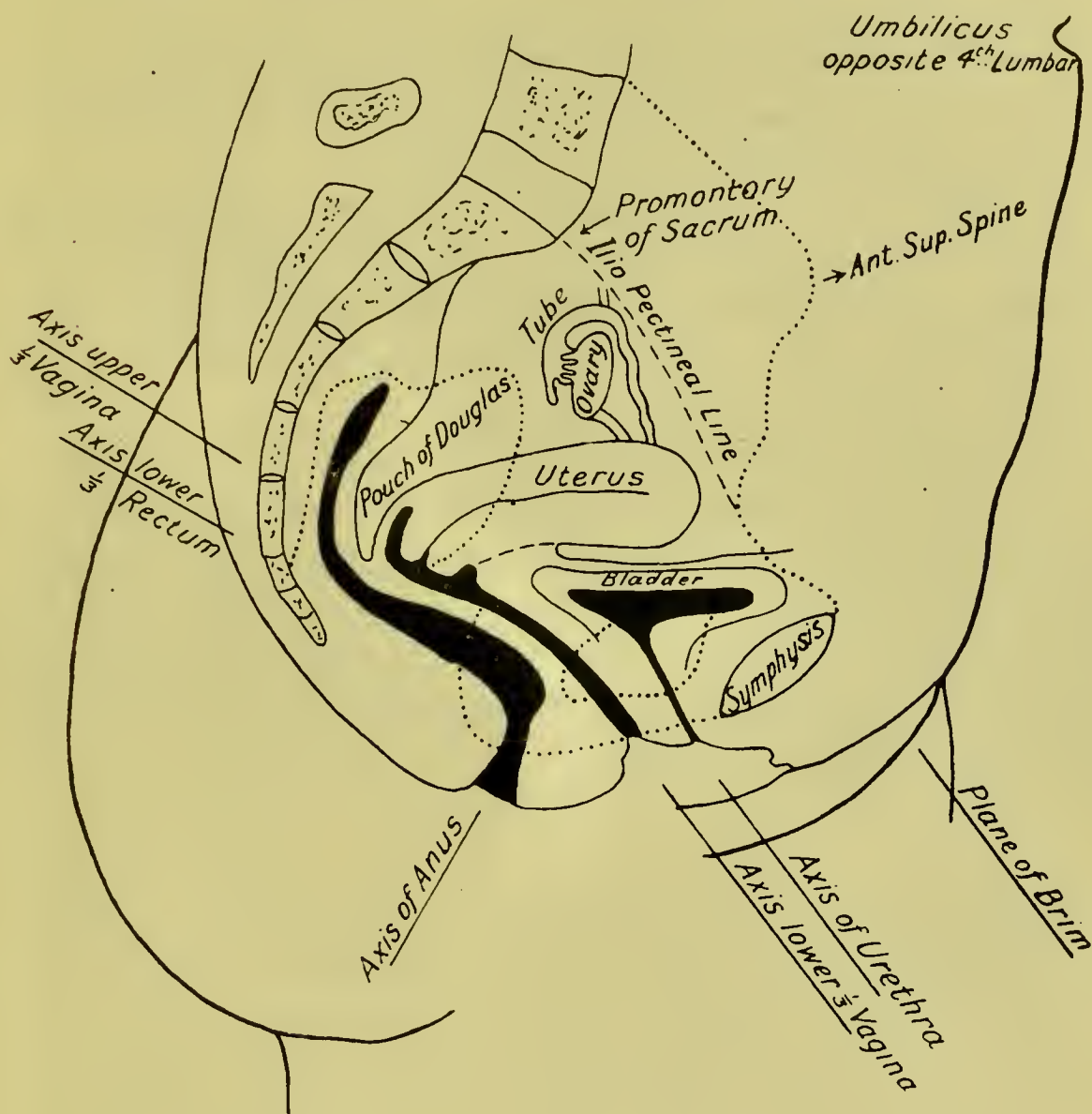


FIG. 3.—SAGITTAL SECTION SHOWING THE NORMAL POSITION OF THE PELVIC ORGANS. THE CORPUS UTERI IS NEARLY PARALLEL WITH THE HORIZON AND THE OS EXTERNUM IS NEAR THE LEVEL OF THE ISCHIAL SPINES.

foramina are more triangular in shape. The acetabula look more forward. The rami of the pubis and ischium are everted.

*Cause.*—Influence of sex. The sexual difference is seen about the fourth or fifth month in the foetus. Experiment shows that the sexual differences of the pelvis are dependent upon the internal secretion from ovaries and testicles.

Pregnancy causes a softening and vascularity of the inter-articular cartilages, especially the symphysis. Thus, there is

## 6 THE PELVIS FROM THE OBSTETRIC STANDPOINT

a slight motility of the sacro-iliac joints, which is of importance in reference to Walcher's hanging-leg position for flat pelvis (see p. 347).

### 4. Pelvis modified by Soft Parts.

*False Pelvis.*—The iliac bones are covered by muscles, and in front the abdominal muscles enclose the false pelvis.

*True Pelvis.*—The soft parts influence all the diameters of the true pelvis, especially the pelvic outlet.

I. *Brim.*—(a) The conjugate is narrowed slightly by the bladder wall; (b) the transverse by the psoas and iliacus muscles; and (c) the left oblique by the sigmoid flexure.

II. *Cavity.*—The obturator foramen is covered by the obturator internus muscle.

III. *Outlet.*—This is filled in by the pelvic floor (Fig. 3).

The *pelvic floor* fills in the outlet of the bony pelvis and has the external genitals on its outer aspect; the vagina, urethra, bladder and rectum in its substance; and the uterus with the annexa and peritoneum on its upper surface. The levatores ani muscles and the strong fascia support and form the main bulk of the pelvic floor (Fig. 3).

## *PART II.*

### PHYSIOLOGY OF PREGNANCY.

#### **I. Introductory.**

##### **1. Puberty—Nubility—Menopause.**

**Puberty.**—This is the age at which a girl becomes a woman, and enters on the reproductive period of her life. It occurs in Great Britain about the ages of 14 to 16. The character changes; the mammae develop; the hips widen; hair grows on the genitals, and the corpus uteri grows to full size. Menstruation and ovulation begin, and the woman is now capable of becoming pregnant.

**Nubility.**—Although a girl is capable of becoming pregnant with the onset of menstruation at puberty, yet the genitalia are not fully developed till about the age of 20. Before this age the vagina and vulva are small, so that parturition is more dangerous for both mother and child. The most suitable age for marrying and beginning to bear children is 20 to 25, both as regards safety during parturition and a low rate of sterility. With each succeeding year after the age of 26, in which a woman may be married, the percentage rate of sterility rises.

**Menopause—Climacteric—Change of Life.**—The usual age is 40–50, mostly 45–50, and it lasts 1–3 or even 5 years. During this time the menses cease. The symptoms are mostly nervous, such as sudden flushings, waves of heat, tremblings, headaches, palpitation and gastro-intestinal disturbance. The mammae and generative organs gradually atrophy as the woman is now past the reproductive period of her life. Some women tend to become stout, others thin and angular.



## 2. Menstruation.

**Synonyms.**—Catamenia. Courses. Periods. Flow. Monthly Illness. Flowers.

**Menstruation** is a cyclical change, with general and local symptoms, occurring at regular periodic intervals as a general rule. The most marked phenomenon is a flow of blood from the uterine cavity, this flow being an expression of the changes which the endometrium has undergone in preparing for the reception of a fertilized ovum. The years during which menstruation occurs mark the reproductive period of a woman's life. Beginning at the age of puberty and ending during the menopause, this period lasts about 30 to 35 years. At *puberty* the regular flow may be established at once, or it may come on gradually or be intermittent or irregular for a time. At the *menopause* it may cease suddenly or gradually, or it may be intermittent, with in some cases excessive discharge. The menses are normally in abeyance during pregnancy and lactation, but there are exceptions to this rule, as occasionally a periodic flow may occur during the first two months of pregnancy, and not infrequently the menses return four months after labour, although the mother suckles her child till the ninth month.

**Menstrual Habit.**—This refers to the amount of blood lost and the duration of the flow.

**Amount.**—The average quantity is 4 to 6 ounces, but may be normal up to 9 ounces. Approximately one napkin is soaked by half an ounce of blood, so that a cleanly woman uses from eight to twelve napkins. An estimate of the blood lost may be made by noting the number of napkins used.

**Duration.**—The average is 3 or 4 days, but a flow lasting 5 or 6 days is not infrequent.

**Menstrual Type.**—This refers to *periodicity*, counting from the beginning of one flow to the onset of the next. The most common type is 28 day, but there may be a 21, 26, or 30 day type, or in some cases an irregular type. In rare cases a woman may normally have a 4 or 6 months type.

The *normal* menstrual *cycle* is 28 days, and it is divided into *four* phases or *periods*.

1. *Premenstrual Period.*—This lasts 6 or 7 days, during which there occur proliferation and swelling of the endometrium,

ending in haemorrhages. The uterine mucosa thickens two or three times. The glands become elongated and tortuous, having a serrated appearance on long section due to enlargement of the gland cells throwing the walls into folds. The glands are dilated, appear closer together, and are filled with mucous secretion. The stroma cells enlarge in the superficial layer, become roundish or polygonal, and represent a preliminary stage of decidual cells. Towards the end of this period the blood vessels get engorged and dilated, small sub-epithelial haemorrhages occur, small portions of epithelium are torn away, blood escapes partly by rupture and partly by diapedesis, and menstruation begins.

2. *Menstrual Period*.—This lasts 3 or 4 days, and is the period of discharge of blood, the mucosa undergoing extensive degeneration and decreasing in thickness. The flow, at first viscous blood-stained mucus, becomes in a few hours brownish, and then arterial. Normally it is quite fluid and does not clot, due to mixture with mucus from the uterine glands. At the end of the flow the discharge becomes mucus and then ceases. The cervix dilates during the flow. The vulvar and vaginal secretion are increased, and there is often a peculiar odour given off, like that of marigolds. The uterine mucosa rapidly shrinks, owing to effusion of blood, diminution of oedema, and expulsion of glandular secretion. The glands become straight and narrow, and the emptied gland cells low and small. The most altered stroma cells break down and are expelled, the rest diminish in size. The surface epithelium is regenerated by the end of menstruation.

*General Symptoms or Menstrual Mollimina*.—There is a feeling of weight or fulness in the pelvis, and dull backache or sacralgia, also uneasiness, tenderness or swelling of the mammae. There may be sickness, actual vomiting, headache, palpitation and other symptoms.

3. *Postmenstrual Period*.—This lasts 4 to 6 days, during which the mucosa regenerates. The mucous membrane is thin, the glands almost straight and the stroma cells fusiform. After a few days the glands again become larger and slightly wavy, and the stroma cells more succulent. The resting stage is now reached.

4. *Intermenstrual Period or Resting Phase*.—This lasts about 14 days. The mucosa is almost at rest, and only undergoes



a very gradual increase in thickness. It is 2 mm. thick, greyish red, smooth, and covered by a single layer of ciliated cylindrical epithelium. The tubular glands are slightly spiral, run obliquely to surface of mucosa, and are lined by a single layer of columnar cells, which enlarge towards the end of the resting stage. The stroma cells are fusiform or stellate, with large nuclei rich in chromatin, and have little plasma, so that the mucosa resembles adenoid or embryonic connective tissue.

*Cause of Menstruation.*—The premenstrual swelling and hyperaemia of the mucosa, the swelling of the stroma cells, the increased glandular activity and the formation of two layers, a compact and a spongy layer, representing a preliminary stage of the decidua, are all regarded as a preparation for the reception of an ovum, should it be fertilized. If the ovum is not fertilized, the mucosa, having failed to fulfil its purpose, degenerates, and menstruation occurs as a secondary process. Each menstrual period may be regarded as an abortion of an unimpregnated ovum.

Menstruation depends on the presence of ovarian tissue, as if both ovaries are removed the menses cease. The influence is a chemical one, due to the internal secretion of the ovaries, and it is this unknown substance which, circulating in the blood, causes the local changes and general disturbance.

### 3. Ovulation—Escape of Ovum and Transit to Uterus.

**Structure of Ovary, Follicles and Ovum.**—The *ovary* develops on the inner aspect of the Wolffian bodies from a special portion of the coelomic lining. In the foetus the cells forming the ova are the oögonia, which at birth or shortly after become oöcytes of first order, and only require further growth and maturation or ripening.

The *ovary* (Fig. 7) is composed of (a) a cortex or parenchymatous zone, in which the primary ova lie;

(b) A medullary zone or zona vasculosa.

From without we see in a cross section

1. Waldeyer's germ epithelium (columnar near puberty, later cubical).
2. Tunica albuginea.
3. Connective tissue and Graafian follicles (ovisacs) in which the ova lie.

*Follicles.* There are three varieties: (a) primary (Fig. 4); (b) growing (Fig. 5); (c) ripe (Fig. 6).

**Structure of Ripe Follicle.**—The ripe follicle has the following structure (Fig. 6):

1. Tunica fibrosa or externa
2. „ propria, or vasculosa or interna } = theca folliculi.
3. Membrana granulosa or follicle epithelium (columnar cells).
4. Discus proligerus (cumulus oöphorus). A crowd of cells in which the ovum lies. The nearest cells round the ovum form the corona radiata, or ovum epithelium.
5. Liquor folliculi.

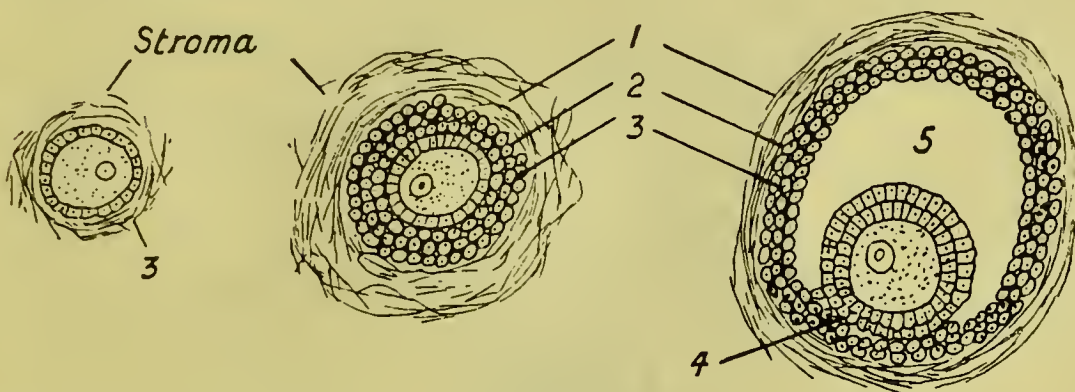


FIG. 4.—PRIMARY.

FIG. 5.—GROWING.

FIG. 6.—RIPENING.

GRAAFIAN FOLLICLES. (1 to 5, see text above.)

*The Ripe Ovum or Oöcyte is a cell 0.2 mm. in diameter, and has the following structure:*

1. Zona pellucida, very broad and finely striated radially.
2. Perivitteline space.
3. Yolk or oöplasm or vitellus (a) protoplasm, outer clearer and finer portion; (b) deutoplasm, inner coarser and darker portion. Primordial ova have (a); ripening (a) and (b); ripe only (b).
4. Germinal vesicle or nucleus, with a fine, somewhat scanty reticulum containing chromatin.
5. Germinal spot or nucleolus.
6. Centrosome.

#### Process of Ovulation.

This includes (a) ripening or maturation; (b) rupture or dehiscence of a Graafian follicle, with escape of the ovum into the abdominal cavity. A ripe follicle may rupture at any time, but it probably usually ruptures just before menstruation is due, the onset of the flow occurring because the ovum has not been fertilized.



*The Ripening or Maturing Follicle* lies deep in the ovary, increases in size and grows towards the surface of the ovary, where it projects, forming a protuberance devoid of germ epithelium. This prominent part, the *hilum* or *stigma folliculi*, degenerates (necroses), and here the follicle ruptures when ripe, due to *external* pressure from *thickening of the tunica vasculosa*. This thickening is due to a swelling of its cells with yellow particles—lipochrom—(hence lutein cells), and causes it to become arranged in a wavy manner. While the lutein cells are forming there is occurring a *fatty degeneration* in the cells of the stratum granulosum, and cumulus.

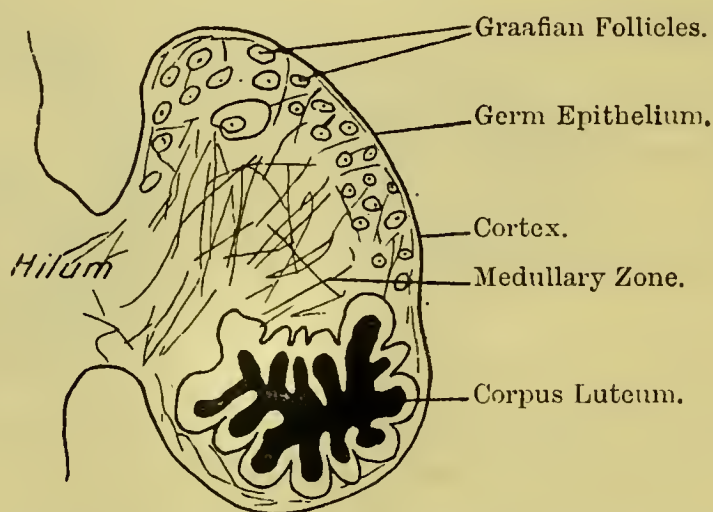


FIG. 7.—OVARY WITH A CORPUS LUTEUM.

This enables the ovum to break loose when the follicle ruptures. The ovum, surrounded by a few layers of cells (corona radiata cells), escapes in a rush of liquor folliculi into the peritoneal cavity. Thence it passes into the Fallopian tube and on into the uterus—probably directed by the serous current set up by the action of the cilia lining the fimbriae and tubal mucosa.

The ovum loses its protective covering of cells in its passage along the tube.

#### 4. Formation of Corpus Luteum (Fig. 7).

After the ovum escapes, the follicle partly collapses, closes and fills with blood from the torn vessels. The lutein cells, which are formed from the tunica propria, and are of a polygonal epithelioid character with a yellow colour, proliferate actively so that the follicle wall becomes much convoluted, presses inwards and encroaches on the primary blood-clot till



an irregular stellate space is left in the centre. The central blood-clot, at first red, gets organized, becomes grey and is absorbed. The proliferating lutein cells occlude the cavity, then undergo hyaline degeneration and lose their yellow colour, so that a clear colloid mass (*corpus albicans* or *fibrosum*) is left, which in turn gradually shrinks till only a small depressed cicatrix is left. There is no difference between the corpora lutea of menstruation and pregnancy except one of size and duration.

*Corpus Luteum of Menstruation* (*corpus luteum spurium* or false corpus luteum).—This increases in size till the end of the third week, and measures about  $\frac{1}{2}$  inch in diameter. It then shrinks, and by the end of the second month forms a cicatrix which later disappears.

*Corpus Luteum of Pregnancy* (*corpus luteum verum* or true corpus luteum).—This grows for 3 or 4 months to measure about  $\frac{3}{4} \times 1$  inch. It then gradually shrinks, and by the end of pregnancy forms a stellate cicatrix which may persist for 1 or 2 months after parturition.

### 5. Maturation or Ripening of Ovum.

This is the process by which the ovum is prepared for the reception of a spermatozoon. It occurs with every healthy ovum, whether it is likely to be fertilized or not, and usually begins just before the rupture of a Graafian follicle. The nucleus migrates to the periphery of the ovum and divides into two halves, one of which is extruded as the first polar body or polocyte. The remaining portion of the nucleus again divides, and the second polar body is extruded. At the same time, though not always, the first polar body undergoes division. Four bodies are thus formed by a rapidly succeeding division of the nucleus, viz. three small polar bodies or polocytes and a larger body, the *female pronucleus*, which contains only one half of the chromosomes of the original nucleus. The centrosome seems usually to degenerate during these divisions.

With the formation of the *female pronucleus*, which occupies an excentral position, the ovum is sexually ripe and ready for fertilization. The ripe ovum retains its capability of fertilization for about eight days, this also being about the time it takes to pass from ovary to uterus. If it reaches the uterus without being fertilized it is lost.

### 6. Conception and Fertilization.

The fructifying element in the spermatic fluid of the male is the spermatozoön or spermium, and it is calculated that an average ejaculation contains 200 millions. The spermatic fluid or semen is usually deposited in the vaginal vault, where it bathes the vaginal portion of the cervix. From this deposit the spermia can easily and quickly enter the cervical canal. Penetration and ejaculation into the vagina are not absolutely essential to fertilization, since deposit of semen on to the vulva may be sufficient, the spermia in such a case travelling up the vagina by their own movement to reach the uterus. The author has met several instances where pregnancy has occurred although the hymen was intact and the opening so small that penetration could be proved impossible.

The sperm is eel-like, with a flattened head  $4\frac{1}{2}$  micron long, a short neck, and a slender tail about 50 micron long, which enables it to move onward at the rate of about 1.5 mm. per minute.

The spermia pass up into the uterine cavity and along the Fallopian tube by their own tail movement, the directing force guiding them in this direction being the normal current which flows outwards from the abdominal cavity to vagina due to the action of the ciliated epithelium lining tubal and uterine mucosae. The shape of the spermia causes them to head this current, so that they swim against it and thus travel by the most direct route towards the fimbriated end of the tube. This outward moving current is of great importance for fertilization, but it must not flow at a greater rate than the sperms can travel, as they are carried back by a flow which exceeds 1.5 mm. per minute. A copious leucorrhoea may thus be a cause of sterility, the spermia being unable to make headway against it.

*Fertilization.*—Impregnation of the ovum by the spermium occurs normally in the *Fallopian tube*, probably in the outer third, but it may also take place on the surface of the *ovary* or even in a *Graafian follicle*, as proved by ovarian gestation.

Although the spermia can reach the Fallopian tube in two hours it may be days before fertilization takes place, this depending on how long after a fruitful coitus an ovum may be expelled from its Graafian follicle. Spermatozoa have been



found active in the tube  $3\frac{1}{2}$  weeks and in the vagina 2 weeks after the last coitus.

It is now regarded as improbable that fertilization may occur in the uterus. Only one spermium is required for impregnation of an ovum. When the favoured spermium meets the ovum the head bores its way slowly in, the ovum protoplasm rising at the point of contact in the form of a conical elevation called the *reception eminence*. The tail only partly enters and soon disappears. The human ovum has no preformed opening or micropyle in the zona pellucida for the entrance of the spermium. The head of the spermium after entering the ovum forms an ovoid body called the *male pronucleus*. Fertilization is now complete.

The *male and female pronuclei* or sperm and egg nuclei now approach each other, and without fusing into a single nucleus they usually break up into their respective chromosomes, only uniting in the first mitotic figure, the segmentation spindle.

The fertilized ovum or oöperm wanders down the tube by the action of the cilia of the tubal epithelium, taking probably about 7 or 8 days to reach the uterine cavity. During its passage along the tube it loses the zona pellucida and adhering cells of the corona radiata and passes through the first stages of development. Having reached the uterine cavity it embeds itself in the uterine mucosa, which undergoes special changes associated with pregnancy, to be described later.

### 7. Development of Ovum.

The various stages of development in Man being unknown, a complete description can only be given from observation on lower animals.

A number of early human ova have, however, been obtained, the youngest being about 2 weeks old, and from a careful study of them certain differences have been observed as compared with development in lower animals, but these will be described further on under "Differences in Development of the Early Human Embryo" (p. 18).

### Development in Lower Animals (Fig. 8).

As already stated above, the first stages of development, *i.e.* segmentation, occur while the fertilized ovum is passing along the tube to the uterus.

At first a single cell, the fertilized ovum undergoes complete or holoblastic segmentation, dividing into two, then four, eight, and so on till a solid spherical mass of cells, or blastomeres, is formed, the so-called *morula* or *mulberry mass*. In this an outer and an inner cell mass are recognized. A cavity soon appears in the morula which rapidly increases in size, leading to the formation of a hollow sac, the *blastodermic vesicle*, walled by a single layer of cells derived from the outer cell mass, forming the *trophoblast*. At one point on the inner surface of the trophoblast is a small group of cells, the inner cell mass, and corresponding to the *area germinativa* where the future embryo appears (Fig. 8 A).

The inner mass of germinal cells becomes differentiated into an *outer layer* or *ectoblast* closely applied to the trophoblast, and an *inner layer* or *entoblast* which comes to form a complete inner layer round the vesicle (Fig. 8 B).

The blastodermic vesicle rapidly expands, and the trophoblastic cells covering the embryonic ectoblast disappear. The embryonic ectoblast thus comes to be on the surface of the blastodermic vesicle, but at the margin of the embryonic area the ectoblast is continuous with the trophoblast or extra-embryonic ectoblast which forms the outer wall of the extra-embryonic portion of the vesicle. The trophoblast is so called on account of its nutritive function.

At the embryonic area the *mesoblast* forms between the other two layers, and by growing right round the vesicle gives rise to three layers, the ectoblast, mesoblast and entoblast (Fig. 8 B and C).

The mesoblast splits on each side of the protovertebrae in the embryonic area (Fig. 8 C), and this split, which forms a space, the coelom or primary body cavity, spreads round the whole blastodermic vesicle, dividing it into the *somatopleure* layer composed of ectoblast and mesoblast, from which the lateral and ventral body walls are produced, and the *splanchnopleure* layer, composed of mesoblast and entoblast, from which the walls of the primary digestive tract are formed (Fig. 8 D).

A constriction occurs in the somatopleure, marking it off into an embryonic portion, and an extra-embryonic portion from which the amnion and chorion arise (Fig. 8 D). A similar constriction in the splanchnopleure marks it off into an embryonic portion forming the alimentary canal or gut, and



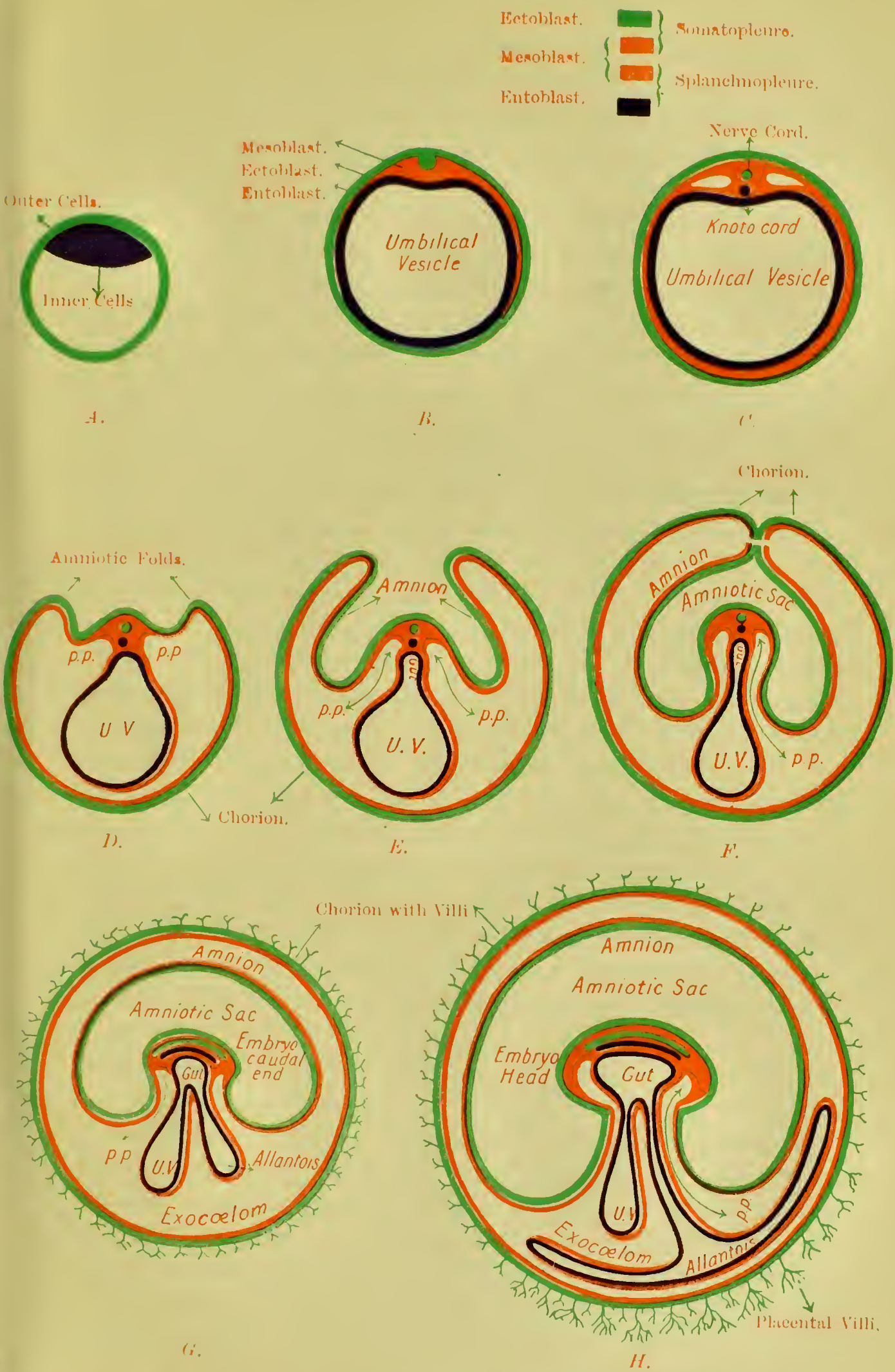


FIG. 8.—DEVELOPMENT OF MEMBRANES AND VESICLES IN LOWER MAMMALS.

p.p. Pleuro-peritoneal Cavity or Coelom. U.V. Umbilical Vesicle.  
A to F are Transverse Sections; G and H are Longitudinal Sections.

To face p. 16,





an extra-embryonic portion forming the umbilical vesicle (Fig. 8 E). The space between is the pleuro-peritoneal or body cavity, which is eventually closed by an inward growth of the ventral plates of the embryonic somatopleure (Fig. 8 PP).

**Amnion and Chorion.**—The extra-embryonic somatopleure rises in a fold over the dorsum of the embryo, which sinks into the vesicle. The folds first meet over the head end of the embryo, the union extending tailward to form the amniotic sac filled with albuminous fluid—the *liquor amnii*—in which the embryo floats (Fig. 8 E and F). The inner portion, after the folds fuse and separate, is the *amnion*; the rest forms the *chorion*. This rising of folds causes the amnion to have its epithelial surface (ectoblast) inside, while the chorion has it outside. The connective tissue surfaces (mesoblast) come in contact by the growth and distension of the amniotic sac (Fig. 8 H). The amnion and chorion form the two foetal membranes. The chorion becomes covered by epiblastic buds to form the *chorionic villi* (Fig. 8 G and H), which become attached to or embedded in the uterine mucosa. The villi get mesoblastic cores and become vascularized about the end of the third week by blood vessels from the allantois.

**Umbilical Vesicle.**—As the ventral plates of the embryonic somatopleure grow round to shut in the body cavity, the constriction in the splanchnopleure vesicle is narrowed (Fig. 8 F) to form the vitelline duct at the site of the future umbilicus or navel. The inner portion is the *gut*; the outer portion is the *umbilical vesicle* which atrophies later. This vesicle becomes vascularized by the omphalomesenteric or vitelline blood vessels which form in the mesoblast.

**Allantoidal Vesicle or Allantois** (Fig. 8 G).—It is formed from a pouch-like projection or diverticulum from the lower end of the primary gut. It grows out into the exocoelom till it reaches the inner surface of the chorion and spreads out to form the rudiment of the foetal portion of the placenta (Fig. 8 H). It takes out two arteries and two veins (one vein disappears) forming the three vessels of the umbilical cord. The portion inside the body forms the urachus and part of the urinary bladder. The stalk forms part of the cord. The primary purpose of the allantois is to receive effete matter excreted by the Wolffian bodies.

**Umbilical Cord.**—It is formed from the stalks of the allantois (with its vessels) and the umbilical vesicle with the portion of the amnion enclosing them.

#### 8. Differences in Development of Early Human Embryo.

The chief differences in the development of the early human embryo are :

1. Early formation of amnion and amniotic cavity by splitting of the ectoblast.
2. Great thickening and rapid proliferation of chorionic ectoblast or trophoblast to form a large sac compared with embryo and amnion.
3. Precocious development of mesoblast and extra-embryonic coelom.
4. Presence of the body stalk or abdominal pedicle which forms a primary and permanent connection between embryo and chorion.
5. Growth of allantois into abdominal pedicle.
6. Early formation of umbilical vesicle by splitting of entoblast.
7. Umbilical cord formed from abdominal pedicle.

**Amnion and Chorion.**—The amnion cannot be formed by a fusion of two folds of somatopleure as it is already well formed when the embryonic area is still in a very rudimentary state (Fig. 9 E). The earliest sign of the amniotic cavity is a space formed by a splitting of the embryonic ectoblast (Fig. 9 c). The ectoblastic floor of this space represents the dorsal surface of the future embryo (Fig. 9 E). The mesoblast proliferates at each end of this space, especially at the future head end of the embryo, where it makes its way between the cells forming the

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FIG. 9.—DEVELOPMENT OF HUMAN OVUM.

- A. Blastodermic Vesicle. Outer and Inner Cells.
- B. Blastodermic Vesicle. Cells differentiating into Ectoblast and Entoblast.
- C. Hypothetical. Cells of Ectoblast and Entoblast being hollowed out to form the Amniotic and Umbilical Sacs respectively.
- D. Formation of Mesoblast between Embryonic Ectoblast and Entoblast.
- E. Mesoblast has invaded between the layers of Ectoblast Cells forming the roof of the Amniotic Cavity, and has also grown round the inner surface of the Chorionic Ectoblast or Trophoblast, and round the outer surface of the Entoblastic or Yolk Sac.
- F. The Mesoblast has split from the head end of the Embryo to form the Amnion and Chorion, and has invaded the Chorionic Villi to form their cores. The Mesoblast attaching the tail end of the Embryo to the Chorion is the Belly Stalk or Abdominal Pedicle.
- G. The Placental Villi are developing, and the Allantois is growing along the Belly Stalk.
- H. The Amnion is developing to come in contact with the Chorion, and is constricting the Umbilical Vesicle.



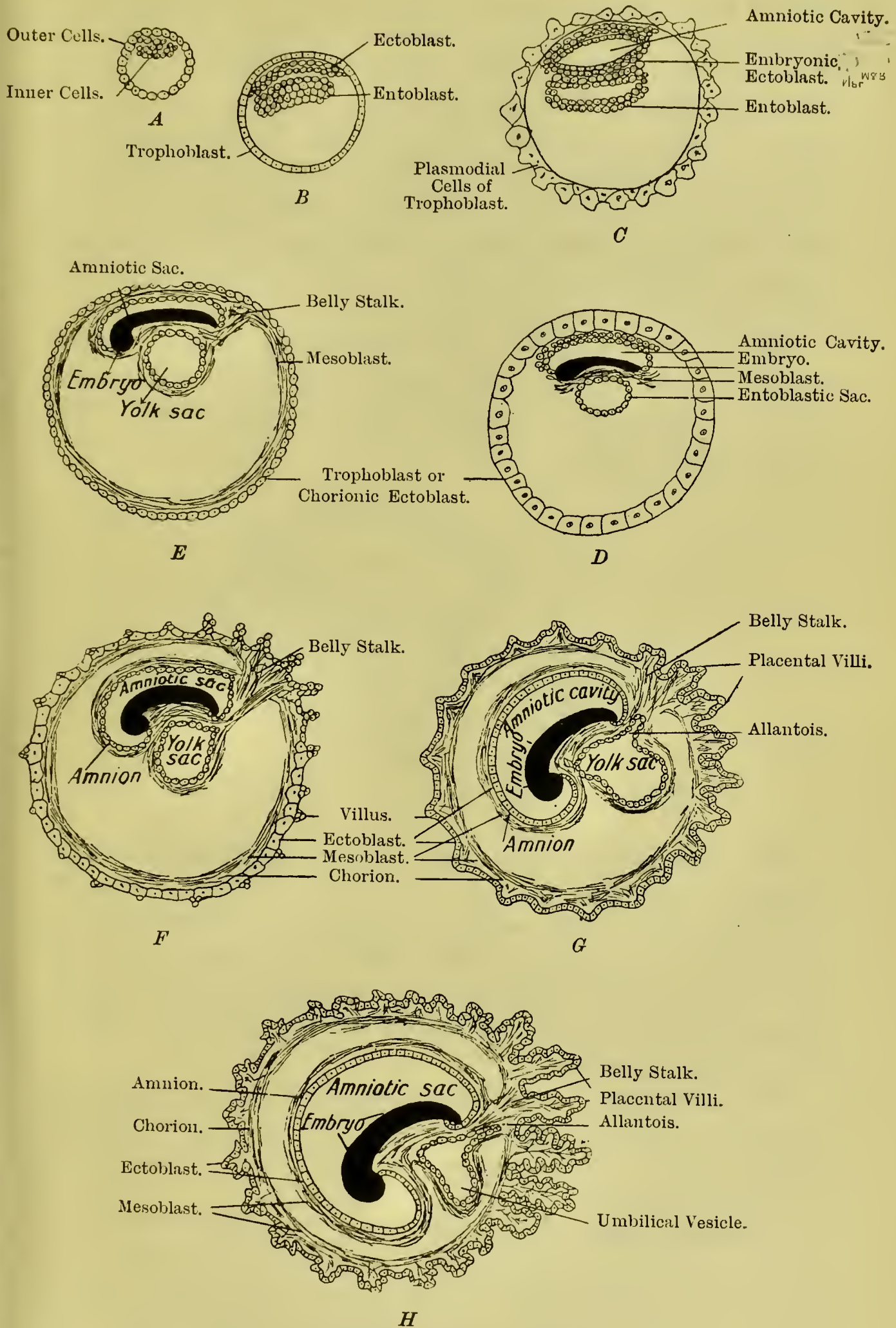


FIG. 9.—DEVELOPMENT OF HUMAN OVUM.

roof of the primitive amniotic cavity, passing towards the tail end, and thus splitting the ectoblast into two layers (Fig. 9 E). The mesoblast, which early surrounds the inner surface of the trophoblast and covers the entoblastic sac, now splits so that the amnion (ectoblast and mesoblast) becomes separated from the blastodermic wall which forms the chorion (Fig. 9 F). During this time the embryo has been developing, and it along with the amnion and umbilical vesicle sinks downwards but remains attached to the chorion at its caudal end by the abdominal stalk or pedicle (Fig. 9 F).

The chorionic ectoblast proliferates rapidly to form, in proportion to the embryo and amnion, a large sac, the wall of which is composed of irregular masses of protoplasm called the *trophoblast* (Figs. 9 D and 17).

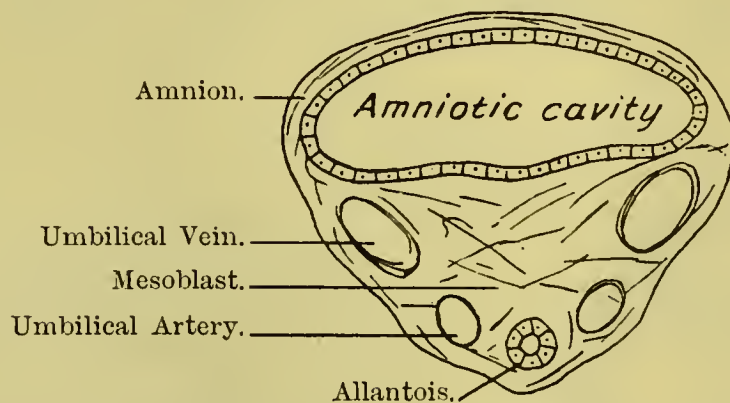
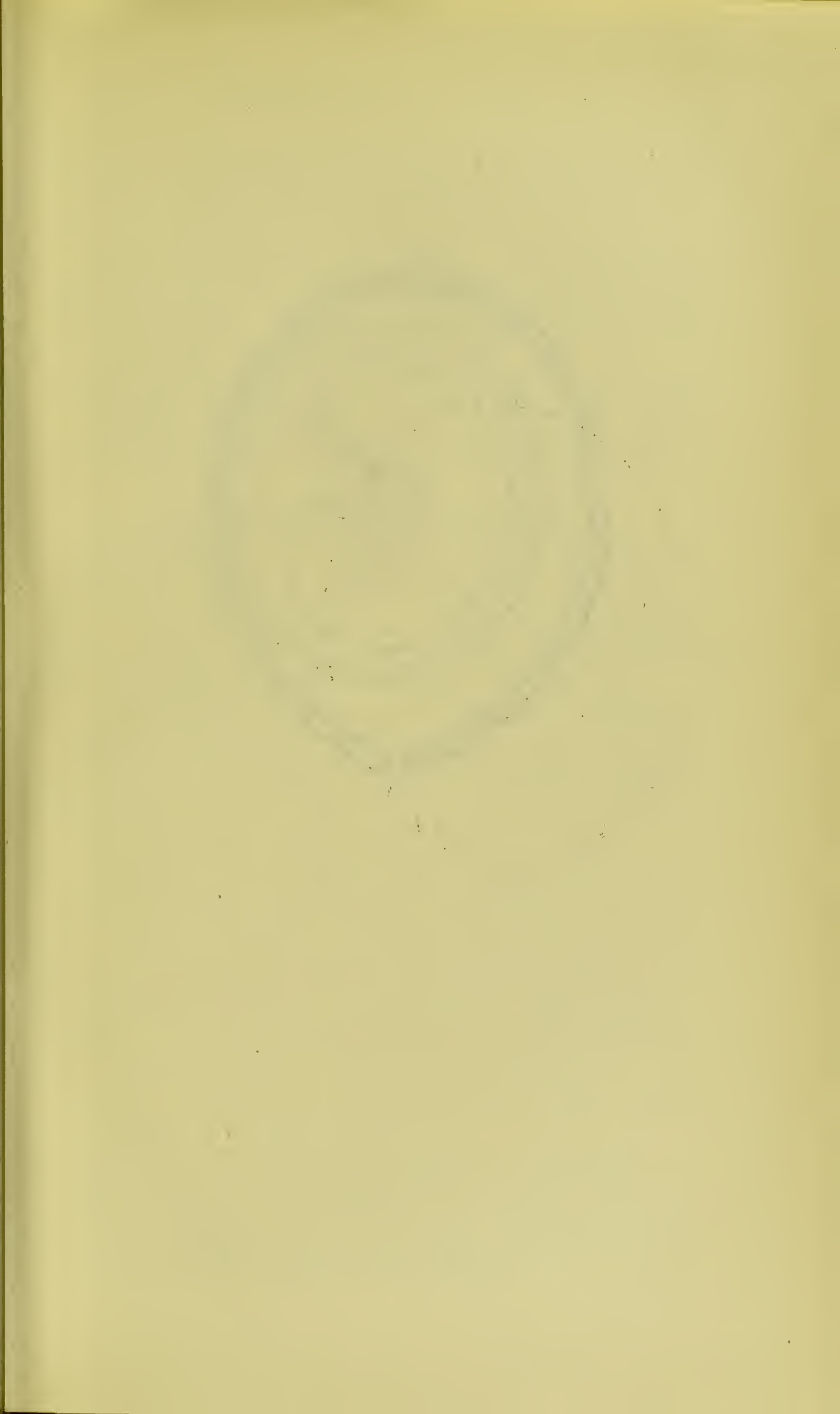


FIG. 10.—SECTION THROUGH THE ABDOMINAL PEDICLE.

The term *trophoblast* is used to distinguish the chorionic ectoblast from that of the embryo and amnion. When it comes in contact with maternal tissues it is transformed into *syncytium* or *syncytio-trophoblast* (Fig. 17). *Syncytium* is the name given to the deeply staining nucleated masses of protoplasm formed by the fusion of the originally separate cells of the chorionic ectoblast.

The trophoblast or syncytium has histolytic or phagocytic properties enabling the ovum to eat its way into the uterine mucosa, and open up maternal capillaries (*vide* "Development of Placenta," p. 33).

*Abdominal Stalk* (Figs. 9 F G H, 10, 11).—This is a mesodermic structure attaching the embryo to the chorion. It is the site of the future *umbilical cord*. It carries out the future umbilical vessels (two arteries and two veins, one vein disappears) to vascularize the chorion and villi. The





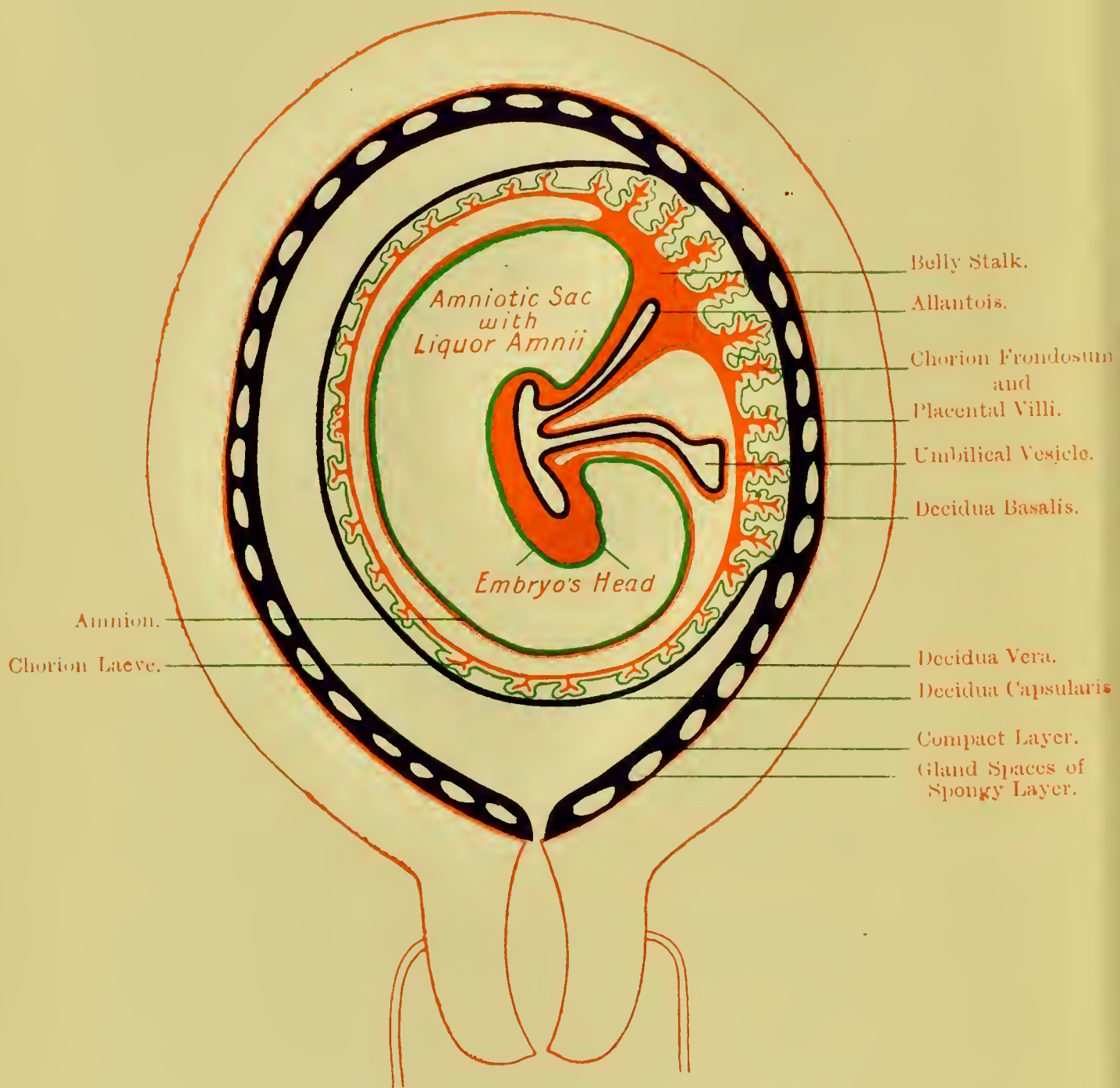


FIG. 11.—DIAGRAM OF AN EARLY GRAVID UTERUS AND HUMAN OVUM, SHOWING EMBRYO, BELLY STALK WITH ALLANTOIS, UMBILICAL VESICLE, AMNION, CHORION WITH VILLI, DECIDUAE VERA AND BASALIS WITH COMPACT AND SPONGY LAYERS, AND DECIDUA CAPSULARIS.



allantois grows along it. The amnion does not form its outer covering but blends with it at the end next the chorion. Its ectoblast covering is continuous with that of the amnion and skin of the embryo.

*Allantois* (Figs. 9 G H, 10, 11).—This is never a free pedicle, but grows out from the lower end of the gut along the abdominal pedicle. It only forms an insignificant short canal, and may not quite reach the chorion.

*Umbilical Vesicle*.—This is probably formed by an early splitting of an originally solid mass of entoblast cells (Fig. 9 C D).

*Umbilical Cord*.—This is formed from the abdominal pedicle with which the stalk of the umbilical vesicle fuses (Fig. 11).

### 9. Relation of Ovum to Uterine Mucosa.

The premenstrual swelling of the uterine mucosa with the formation of a compact and a spongy layer, representing a preliminary stage of the decidua, is regarded as a preparation for the reception of a fertilized ovum when it reaches the uterine cavity. The altered condition of the mucosa favours the implantation of the ovum, and ensures its nutrition.

By the time the ovum reaches the uterine cavity, and begins to embed itself, it is probably only a solid mass of cells not exceeding 0.5 mm. in diameter, since the nutrition necessary for a further stage of development is only likely to be obtained after nidation in the uterine mucosa.

The *implantation*, which is estimated to take about a day to complete, is of the *interstitial* type, as the ovum embeds itself by destroying and dissolving the superficial epithelium and connective tissue of the uterine mucosa, and gets shut off from the uterine cavity by the closure of the site of penetration (Figs. 12 and 17). This histolytic property of the embryonic ectoderm or trophoblast is probably due to the action of a ferment secreted by the ovum itself, and the maternal tissue thus dissolved is probably used by the developing ovum as nutriment, the so-called *embryotrophe*. (See further under "Development of Placenta," p. 33).

The *site of implantation* is usually on the anterior or posterior wall of the upper segment of the uterus, where the mucosa is thickest, and usually between two glands. The ovum rarely implants itself in the angles of the uterus since these present only a slight decidual reaction.

Under the influence of pregnancy the whole uterine mucosa undergoes still further changes converting it into the so-called

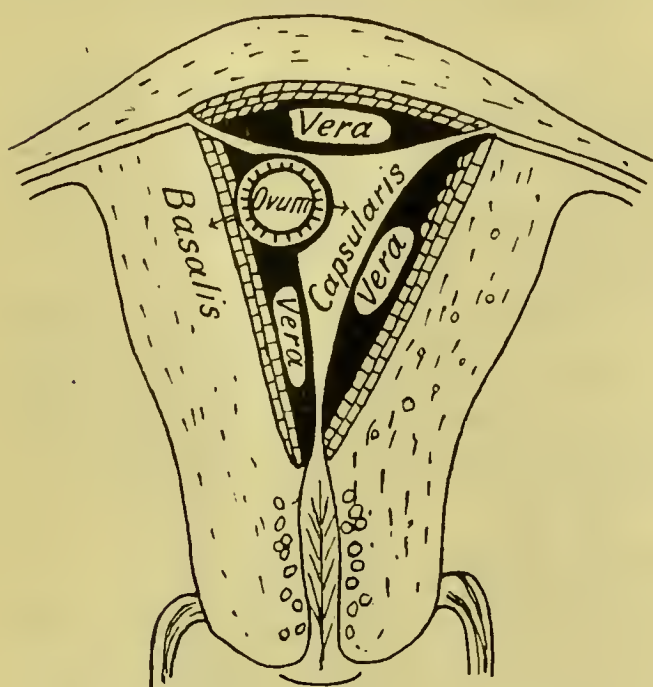


FIG. 12.—ENGRAFTING OF THE OVUM IN THE UTERINE MUCOSA. FORMATION OF THE DECIDUAE VERA, BASALIS AND CAPSULARIS.

*decidua*, and, depending on their relationship to the embedded ovum, special portions are designated by distinctive names as follows:

*Decidua Basalis*.—This is the deep layer of that portion of the mucosa to which the embedded ovum is attached, and which forms the maternal part of the placenta (Figs. 11, 12, 13, 14, 17 and 21).

*Decidua Marginalis*.—This is the portion of mucosa lateral to the ovum (Figs. 13 and 16).

*Decidua Capsularis*.—The opening left by the ovum on the surface of the mucosa is at first closed by coagulum forming a fibrin cover, but later the superficial portion of the decidua grows over and replaces the fibrin cap. This is the decidua capsularis which covers in the ovum towards the uterine cavity (Figs. 11, 12, 13, 17).

*Decidua Vera*.—The whole of the remaining portion of the altered uterine mucosa is called the decidua vera or parietalis (Figs. 11, 12, 13, 15).

The decidua basalis and capsularis were formerly called *serotina* and *reflexa* respectively from an erroneous view as to their formation.

The deciduae will be fully described further on (*vide* "Formation of Deciduae," p. 25).

## II. Alterations in the Uterus induced by Pregnancy.

### 1. Changes in Form, Position, Size and Structure of Uterus.

*Changes in Form*.—During the first three months the uterus becomes pyriform or pear shaped (Fig. 13), due to expansion of the upper segment; then towards mid term more globular,



owing to expansion of the lower uterine segment; after this it gets ovoid, and finally, near full term, egg shaped (Fig. 15). The *cervix* becomes vascular, and soft to the touch, and the cervical canal is filled with a thick mucous plug. From mid term onwards there is a seeming progressive shortening of the cervix due to a flattening of the fornices. This is a false

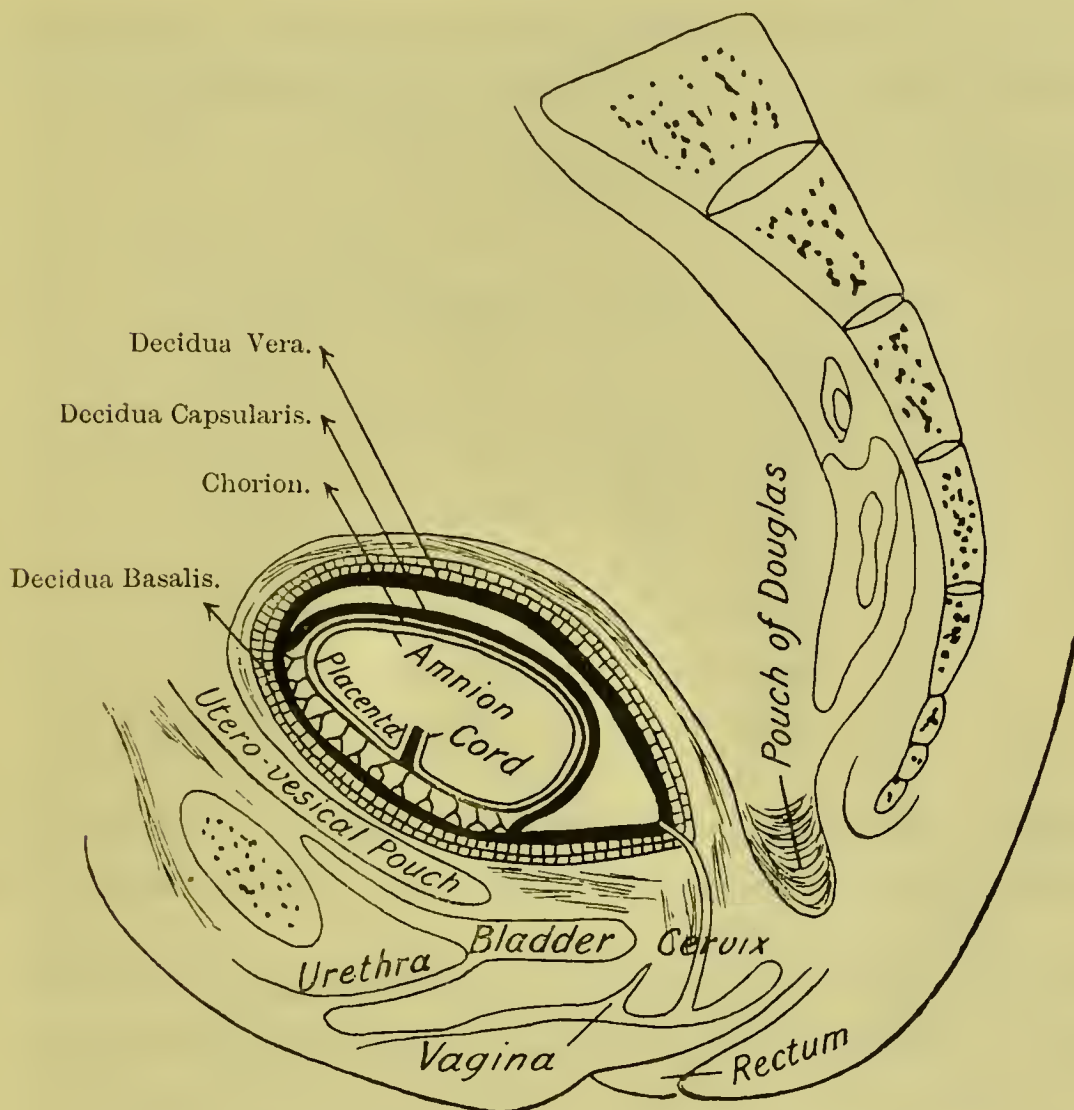


FIG. 13.—A TWO MONTHS' PREGNANT UTERUS. THE DECIDUAE VERA AND CAPSULARIS HAVE NOT YET FUSED.

impression got by the examining finger, since no actual shortening of the cervix occurs till labour begins.

When examining a *multiparous* woman during the last few weeks of pregnancy the cervical canal is frequently so *patulous* that the finger can be passed as far as, or even through, the internal os, enabling one to palpate the foetal presenting part.

*Changes in Position.*—The uterus at first sinks, becomes more anteverted, and presses on the bladder, causing increased frequency of micturition (Fig. 13). After the third month,

rising into the abdomen, it keeps central and against the abdominal wall, displacing the intestines to the sides. After the sixth month it deviates to the right and rotates slightly to the right due to the projection of the spinal column and sigmoid. Torsion may occasionally be to the left. At the end of pregnancy it again sinks, and presses on the bladder, rectum and veins.

*Changes in Size.*—The capacity of the uterus at full time pregnancy is about 400 cubic inches, or about 10 pints. The weight increases from 1 or  $1\frac{1}{2}$  ozs. to 24-28 ozs.

Its dimensions are approximately :

Month.	Length.	Breadth.	Antero-Posterior Depth.
Nongravid	3	2	1 inch.
End of 3rd	$4\frac{1}{2}$ -5	4	3 „
„ 4th	$5\frac{1}{2}$ -6	5	4 „
„ 5th	6-7	$5\frac{1}{2}$	5 „
„ 6th	8-9	$6\frac{1}{2}$	6 „
„ 7th	10-11	$7\frac{1}{2}$	$6\frac{1}{2}$ „
„ 8th	11-12	8	7 „
„ 9th	12-14	$9\frac{1}{2}$	8-9 „

**Changes in Structure.**—(a) *Peritoneal Coat.*—This grows with the uterus, and is loosely attached to the lower uterine segment, but is firmly attached above.

(b) *Muscle-fibres.*—These increase and hypertrophy 7-11 times in length, and 2-5 times in breadth. Thus the uterine wall may reach to a thickness of  $\frac{5}{8}$  inch. At the end of pregnancy the wall thins, owing to distension, and frozen sections show  $\frac{1}{5}$ - $\frac{2}{5}$  inch in thickness. The *position of the placenta* influences the extent of hypertrophy, the portion of the uterine wall below its site enlarging more. If the placenta is inserted on the posterior wall, the uterine ends of the round ligaments are closer together; if on the anterior wall, the ends are further apart.

(c) *Blood and Lymph Vessels.*—These enlarge greatly, and the veins form sinuses in the uterine wall.

(d) *Mucous Membrane.*—This is altered to form the deciduae (see below).

(e) *Round Ligaments.*—These hypertrophy and act as stays for the uterus to fix its fundus during labour.



(f) *Tubes*.—At full time they are almost perpendicular, and come off at the junction of the upper and middle third of the uterus at the sides.

(g) *Ovaries*.—These lie about midway between the fundus and cervix.

## 2. Formation and Structure of Deciduae.

The uterine mucosa is already prepared by the premenstrual thickening for the reception of the ovum, and is already more or less differentiated into a superficial compact layer and a deeper spongy layer when the fertilized ovum embeds itself. When pregnancy occurs the mucosa thickens still further and becomes more vascular. The glands elongate, and in their deeper part dilate and become more tortuous. The connective tissue cells become large, ovoid or polygonal, with large nuclei forming the characteristic *decidual cells*. The mucosa is now called the decidua. The surface of the decidua shows *furrows* due to a further thickening of the mucosa causing foldings. This *formation of furrows* is a *sign* that *pregnancy* has occurred, as they are not seen in a non-gravid uterus.

There are *three* deciduae, named according to relationship to the embedded ovum; the decidua *vera* and decidua *capsularis*, forming the two maternal membranes, and the decidua *basalis*, forming the maternal portion of the placenta (see also under "Relation of Ovum to Uterine Mucosa," p. 21).

**Decidua Vera or Parietalis.**—This is the whole altered uterine mucosa except the part forming the decidua basalis or maternal portion of placenta. It grows in thickness up to 1 cm., and increases in vascularity for the first 3 or 4 months of pregnancy. It then becomes less vascular, mechanically stretched and thin till, by the end of pregnancy, it is only 1 or 2 mm. thick. It also tends to degenerate in the superficial layer, showing coagulation necrosis. The glands in the deeper layer are at first long and spiral, with irregular outline due to papillary projections into their lumen, but these projections disappear after the second month, the gland cavities becoming low and broad, and the lining epithelium flatter. Towards the end of pregnancy the glands only exist in the deeper layer as transverse slits lined by flattened epithelium.

**Three layers** can be distinguished on section (Figs. 11, 12, 13, 15).

(a) *Compact Layer*.—Large decidual cells closely packed together, also spindle and small round cells forming a compact-looking layer. Necks of glands are compressed.

(b) *Spongy, Ampullary or Glandular Layer*.—The same cells are seen, but the whole layer has a spongy appearance due to the spaces or slits formed by the dilated deeper portions of the glands, lined by a single layer of flattened epithelium.

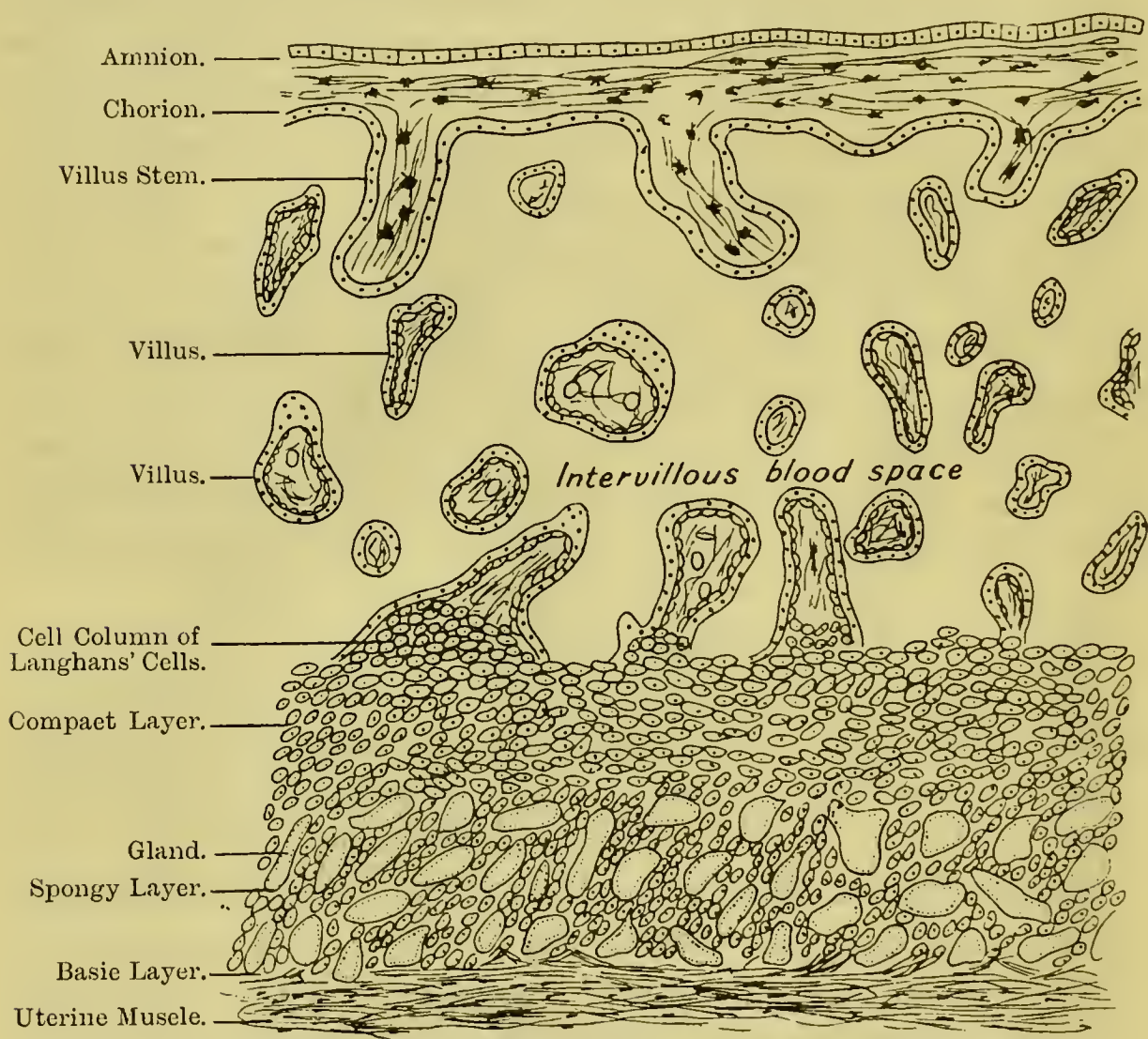


FIG. 14.—DIAGRAM OF A SECTION THROUGH THE EARLY PLACENTA AND DECIDUA BASALIS.

(e) *Deep or Basic Layer*.—A thin layer of mucosa on uterine muscle with blind ends of glands and lined by unaltered columnar epithelium. It is from this layer that the new endometrium is regenerated after abortion or full time labour.

By the end of pregnancy the decidua vera is a thin unimportant layer of maternal tissue containing remains of gland cavities. It forms the outer of the two maternal membranes and covers the chorion laeve or outer foetal membrane since the intervening decidua capsularis has practically disappeared.



**Decidua Basalis.**—Formerly called *decidua serotina*. This is the part of the mucosa where the permanent chorionic villi engraft, and forms the maternal portion of the placenta. It is thinner than the decidua vera, but has the same three layers (Figs. 11, 12, 13, 14, 15, 17 and 21).

(a) The *compact layer* is composed of decidual cells forming the basal plate of placenta; also of foetal ectoderm called the basal ectoderm. *Decidual pillars* project into the intervillous spaces towards the chorion to form, later on, the *septa* which divide the placenta into cotyledons. They are portions of the compact layer which have escaped destruction during the penetration of the trophoblast, and have the same structure. These septa do not reach as far as the chorion, and have villi attached to them. Towards the end of pregnancy, as the result of degeneration of the decidual cells, many of the septa show fibrinoid formation and are largely composed of foetal elements which have penetrated them.

(b) The *spongy layer* is thinner than that of the decidua vera, but shows the same structure, and is continuous with it.

(c) The *deep or basic layer* is continuous with that of the decidua vera, and has the same structure. Large numbers of blood vessels, the *maternal* or *utero-placental*, are seen traversing the decidua basalis to reach the intervillous spaces, both arteries and veins running a sinuous course. Many of the veins dilate to form sinuses. Towards the end of pregnancy the superficial portions are covered by a fibrinoid layer, probably due to coagulation necrosis of trophoblast (*vide* "Structure of Placenta").

*Separation* at abortion or third stage labour, occurs in the *spongy layer* of the deciduae vera and basalis (see *spaces*, Figs. 11, 12, 13, 14 and 21), and a new endometrium is formed during the puerperium from the deep layer left.

**Decidua Capsularis.**—Formerly called *decidua reflexa*. It is the superficial portion of the decidua which covers over the embedded ovum and shows the same decidual cells. Glands are only seen at the base where it joins the decidua vera. It grows out with the distending ovum, and by the beginning of the 4th month comes everywhere in contact with the decidua vera (Figs. 11 and 13). It attains its greatest thickness about the 2nd month, but after this becomes thinned and undergoes fibrinous degeneration. By the 6th month it has practically *disappeared* by being fused with the surface of the decidua vera.

### 3. Divisions of Pregnant Uterus.

In the full time pregnant uterus the following divisions are recognized (see Figs. 36 and 37).

(a) *Body proper or Upper Uterine Segment*.—This is the whole uterine body above the retraction ring, and is the active portion during labour.

(b) *Lower Uterine Segment*.—This is  $2\frac{1}{2}$ - $3\frac{1}{2}$  inches long, and lies between the retraction ring and cervix.

(c) *Cervix*.—This is  $1$ - $1\frac{1}{2}$  inches long.

(d) *Retraction or Bandle's Ring*.—This is about the level of the upper part of the bladder, and is the dividing line between the upper and lower uterine segments.

*Characters of the Lower Uterine Segment*.—(1) Thinness. (2) Loose attachment of peritoneum. (3) Muscular lamellae separable in longitudinal direction. (4) Circular or coronary vein at upper border, running transversely round the uterus and marking the site of the retraction ring. (5) Membranes loosely attached and easily separable to form the bag of Waters. (6) Plays a passive rôle during labour.

*The placenta and membranes* line the full time uterus. The placenta occupies  $\frac{1}{5}$  of the area, and is *normally* attached *above* the level of the retraction ring. Any *attachment* of the placenta on the *lower* uterine segment is *pathological*, and is called placenta praevia.

**Views regarding Origin of the Lower Uterine Segment**.—The question of origin is not yet settled, and the following views are held:

1. It is entirely uterine in origin, and lies between the retraction ring and the internal os (Leopold).

2. It is stretched cervix, therefore cervical in origin (Bumm).

3. There is a histological internal os situated lower than the anatomical, constituting a neutral zone called the isthmus, which becomes converted into the lower uterine segment as far as is necessary for the attachment of the ovum. The mucosa alters to decidua; the muscle cannot retract, and is passive during labour (Aschoff).

4. It is defined as that part of the uterus which is converted into a canal during labour to allow the foetus to pass, and it corresponds to one-fourth of the total capacity of the uterus (Barbour).



### III. Contents of Gravid Uterus.

**Membranes.**—*Maternal*—Decidua vera, decidua capsularis.

*Foetal*—Chorion, amnion.

**Vesicles of Early Ovum.**—Umbilical vesicle, allantois.

**Organs attaching Foetus to Uterus.**—Umbilical cord, placenta.

**Liquor Amnii.**

**Foetus.**

The *liquor amnii* fills the *amniotic cavity*, in which floats the *foetus* attached by the *umbilical cord* to the *placenta*, which is in turn fixed to the uterine wall at the decidua basalis or *placental site* (Fig. 15). In addition to these contents of the gravid uterus there may be found remnants of the umbilical vesicle and allantois.

If a section be made through the uterine wall from the peritoneum to the amniotic cavity the following structures are cut in the order named.

#### Section through Membranes (Figs. 11, 13 and 15).

1. Peritoneal covering of uterus.
2. Uterine muscle.
3. Decidua vera. Outer maternal membrane.
4. Decidua capsularis which fuses with vera. Inner maternal membrane.
5. Chorion laeve or smooth chorion. Outer foetal membrane.
6. Amnion. Inner foetal membrane.

#### Section through Placental Site (Figs. 11, 13 and 15).

- 1 Peritoneal covering of uterus.
2. Uterine muscle.
3. Decidua basalis. Maternal portion of placenta.
4. Chorion frondosum with villi. Foetal portion of placenta.
5. Amnion. Portion covering placenta.

#### 1. Membranes.

**Deciduae Vera and Capsularis.**—These form the outer or maternal membranes.

For description and structure see p. 25.

**Chorion.**—The chorion is derived from all that portion of the extra-embryonic ectoblast not entering into the formation of the amnion, and with its inner covering of mesoblast surrounds the whole ovum (see p. 18, and Fig. 9 for development). It forms the outer of the two foetal membranes, and lies

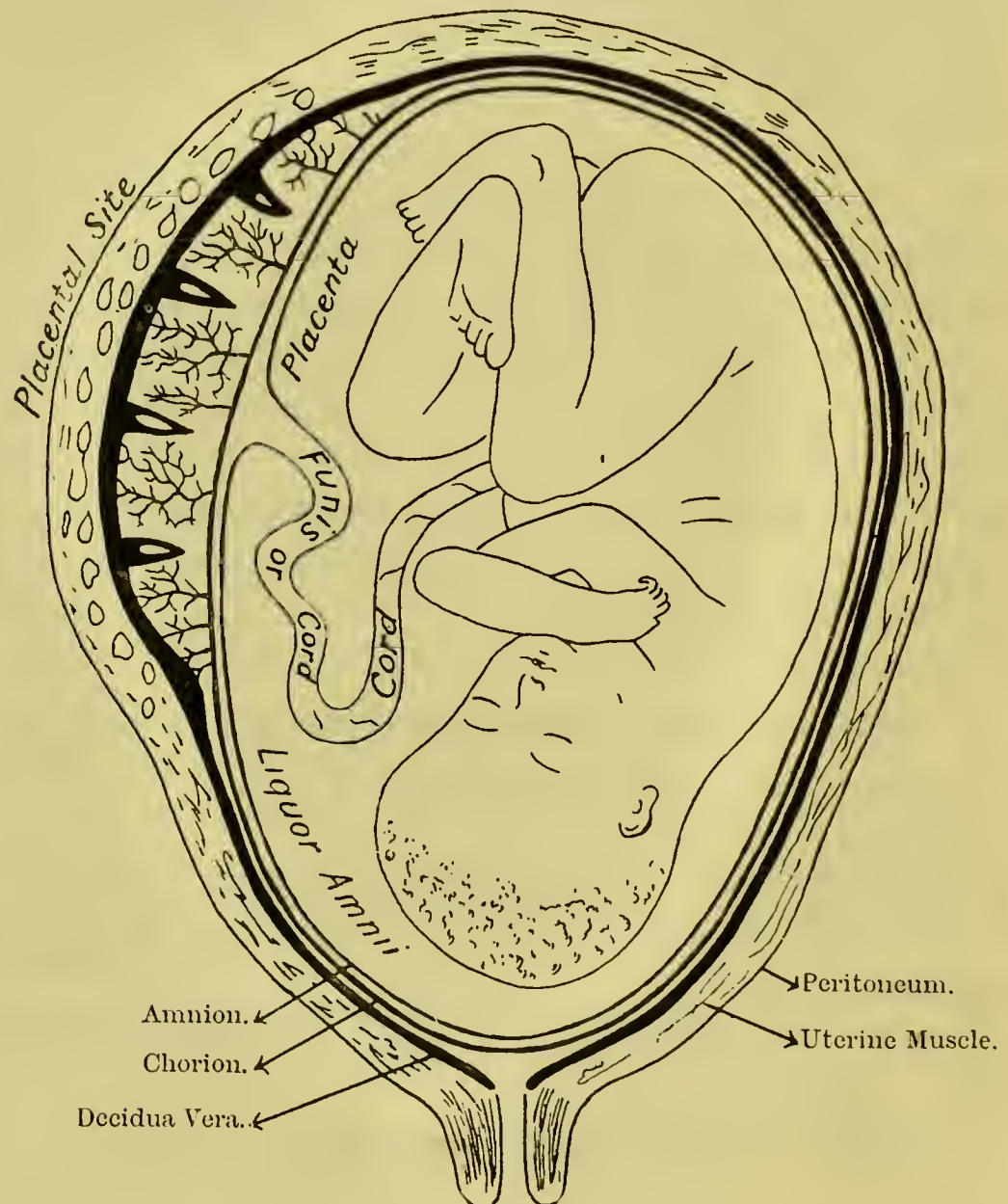


FIG. 15.—DIAGRAM OF A FULL TIME PREGNANT UTERUS SHOWING FOETUS, PLACENTA, CORD AND MEMBRANES. THE DECIDUA CAPSULARIS IS FUSED WITH THE DECIDUA VERA.

between the deciduae capsularis and basalis and the amnion (Figs. 11 and 15). In the early ovum it is completely covered by villi, which project into or are attached to the deciduae capsularis and basalis (Figs. 9 and 11). At first the villi are buds of ectoblast, but by the third week they get blood vessels from the growth of mesoblast into them.

All the villi, with the exception of those forming the foetal portion of the placenta, disappear after the second month. On



the other hand, the villi attached to the decidua basalis increase and branch greatly, and thus up to the beginning of the fourth month the placenta is gradually formed (Figs. 11, 14, 15, and 21).

From the beginning of the fourth month the chorion is devoid of villi, except at the placental portion, and being smooth, is called *chorion laeve*.

**The Chorion Laeve.**—The chorion laeve (Figs. 11, 13 and 15) is a thin, roughish, non-vascular membrane, showing inequalities, the remains of former villi. At term it consists of a few layers of epithelial cells (ectoblast) and connective tissue, fibrils, stellate and spindle cells (mesoblast). Externally there is a zone containing scattered oblong or round hyaline bodies, the remains of early villi. Degenerative changes occur in the epithelium, leading to the formation of fibrin-like material. When examined after birth, degenerated remains of the compact layer of the decidua vera are found on its external surface.

**The Chorion Frondosum.**—The chorion frondosum, or shaggy chorion, is the portion where villi persist to form the foetal portion of the placenta (Figs. 11, 13 and 14).

**Amnion.**—The amnion is formed by a splitting of the embryonic ectoblast, and gets covered by the mesoblast, which grows over it externally (see "Development," p. 18, and Fig. 9). It forms the inner of the two foetal membranes (Figs. 11, 13 and 15), and is a thin, translucent, non-vascular membrane tougher and more elastic than the chorion. The epithelial covering is a single layer of cubical cells, and is inside on the foetal surface. The connective tissue (mesoblast) unites with that of the chorion, but is *easily separable*. The epithelium is continuous with that covering the umbilical cord. *Sometimes a little fluid* (from one-half to a few ounces) is found between the amnion and chorion—the amnio-chorionic fluid.

## 2. Vesicles of Early Ovum.

**Umbilical Vesicle.**—The umbilical vesicle probably arises by an early splitting of a solid mass of entoblast cells (see "Development," pp. 17 and 21, and Fig. 9). The vesicle itself atrophies, and its remnant is frequently seen as a small, yellowish, pea-like body, 1 to 5 mm. in diameter, lying on the surface of the placenta, and below the amnion, a few inches from the insertion of the umbilical cord.

The duct is elongated, owing to rapid expansion of the amnion, and by about the sixth week is a long narrow tube. It fuses with the abdominal pedicle, thus entering into the formation of the umbilical cord, but remains of the stalk may be seen up to the third month.

The intra-abdominal portion of the duct may persist as Meckel's diverticulum, from 2 to 3 inches long, and connected with the ileum about 32 inches above the ileo-caecal valve.

**Allantois.**—The allantois is an outgrowth from the caudal end of the gut along the abdominal pedicle, and forms a short canal which may not quite reach the chorion (see "Development," p. 21, and Fig. 9). It is obliterated by the third month, but remains may be seen as a fine column of epithelial cells lying between the umbilical arteries in sections of the cord taken near the umbilicus (Figs. 10 and 16).

### 3. Umbilical Cord.

*Synonyms.*—Funis. Funiculus umbilicalis. Navel string or cord (Fig. 15).

*Development.*—It is formed from the abdominal pedicle along which the allantois and vessels grow (Figs. 9 and 11). The stalk of the umbilical vesicle fuses with the pedicle. The whole structure is covered by ectoblast continuous with that of the amnion and foetal skin.

*Description.*—It is a spiral, twisted, cord-like structure of about little finger thickness, (from  $\frac{3}{8}$ - $\frac{5}{8}$  in.) The spiral usually runs as if the foetus had been twisted from left to right while suspended from the placenta, and is due to unequal growth of the two umbilical arteries. The average length is 20-30 ins., but it may vary from 3 ins. to over 5 ft. The author had one example over 5 ft. 6 ins. long. It has a dull, white, moist appearance, and one can see the vessels showing through the outer covering. It attaches the foetus to the placenta. The foetal end at term is at the navel, near the centre of the abdomen, but the younger the foetus the nearer the navel is to the pubes. The placental end is usually eccentric; rarely central. The foetal skin may pass up on to the cord from the navel for a distance of from  $\frac{1}{4}$  to  $\frac{3}{8}$  in.

**Structure** (Fig. 16).—(1) *Sheath.*—A single layer cubical epithelium continuous with that of amnion and foetal epidermis.







FIG. 17. — DIAGRAM OF PETERS' HUMAN OVUM ABOUT THE FOURTEENTH OR FIFTEENTH DAY, SHOWING THE PROCESS OF EMBEDDING IN THE UTERINE MUCOSA. (After Bumm.)

1. Epithelium of Mucosa which is absent at (10) the Seat of Invasion of the Ovum.
2. Uterine Glands.
3. Connective Tissue of Mucosa.
4. Foetal Ectoblastic Reticulum or Trophoblast of the Ovum, with commencing villous formation and widely branching buds of syncytium which dip into a network of blood-spaces that communicate with—
5. The Capillaries.
6. Mesoderm Extension.
7. Uterine Glands in spongy layer of Decidua.
8. Uterine Muscle.
9. Blood and Fibrin Cap covering in
10. The Seat of Invasion by the Ovum.

(2) *Wharton's Jelly*.—Loose mucous connective tissue with stellate cells and fibrils. The two arteries are continuous through the navel with the hypogastrics. It has only one vein, which passes through the navel to the under surface of the liver. The arteries have *no* elastic nor outer coat, but the walls are very rich in muscle, in which elastic fibres are present. Apart from the spiral twist of the cord, the vessels run a tortuous course, and also show sudden bends backwards, forming false knots.

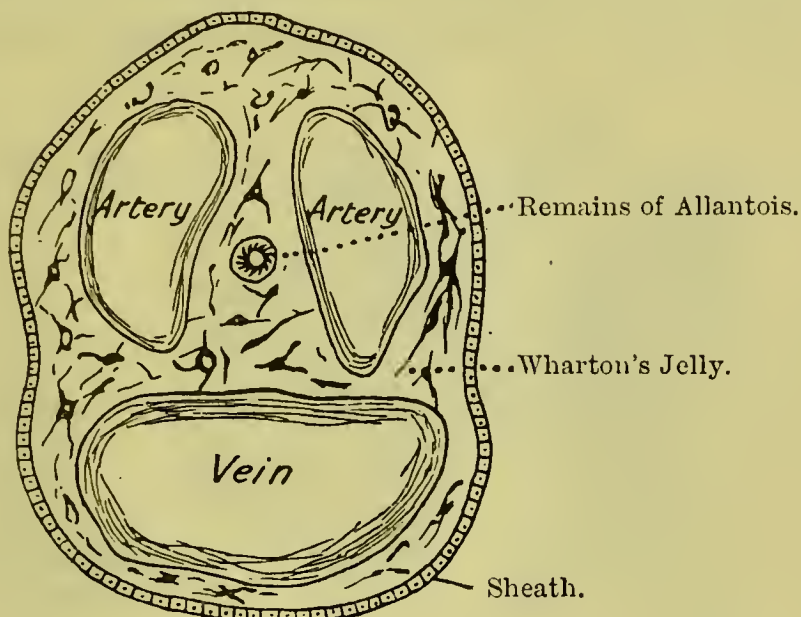


FIG. 16 —A MICROSCOPIC SECTION OF THE FOETAL CORD.

They do not branch till the placenta is reached, when they spread over its surface underneath the amnion before dipping into its substance to form the capillaries of the chorionic villi. It is rarely inserted into the membranes as a velamentous insertion of the cord. Under the skin of the umbilicus there is a net-work of blood vessels sharply defining where the cord ceases on the abdominal wall. This arrangement of vessels is important in connection with the shrivelling and dropping off of the cord after the birth of the child.

#### 4. Placenta or After-Birth.

The placenta begins definitely to be formed by the end of the sixth week, and originates by the union of the *chorion frondosum* (foetal portion) and *decidua basalis* (maternal portion). Nearly the whole of the placenta as seen after birth is foetal, the maternal portion being a very thin layer of decidua.

*Development of Placenta and formation of Intervillous Spaces* (Fig. 17).—While the early ovum is embedding itself in the



decidua the embryonic ectoderm or trophoblast proliferates and, by its histolytic action, dissolves and invades the surrounding decidual tissue. Maternal capillaries are thus opened into, and the blood escaping forms cavities bounded partly by trophoblast and partly by decidua. More vessels are opened up by a continuance of this process, so that in a short time the greatly proliferated trophoblast in which vacuoles form has a reticulated appearance, due to the presence of blood spaces filled with maternal blood, which has penetrated them. These blood spaces represent the earliest formation of the

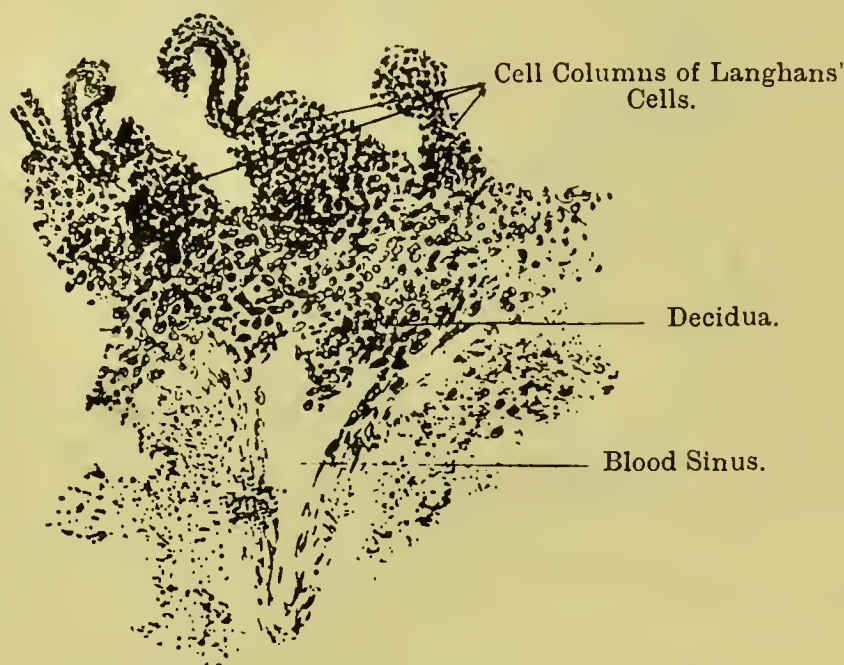


FIG. 18.—MICROSCOPIC SECTION, 5TH WEEK OF PREGNANCY, SHOWING LANGHANS' CELL COLUMNS ATTACHED TO THE DECIDUA.

intervillous blood spaces of the future placenta (compare Figs. 11, 14, 15 and 21).

The trophoblast becomes broken up and compressed into irregularly-shaped masses, giving the chorion a villous appearance, the so-called *primary villi*, some of which extend to the surrounding decidua. These masses afford the epithelial basis from which the chorionic villi are developed, being invaded by connective tissue offshoots from the mesoblast during the second week (see Figs. 9 and 11).

The epithelium becomes arranged in two layers; the outer being the *syncytium*, a nucleated band of protoplasm; the inner being the *Langhans' layer*, a distinct layer of cells (see Figs. 14 and 22). The majority of the villi project into the intervillous spaces (Figs. 14, 15 and 21), but some of them are attached to the decidua, and serve to fix the ovum (the *fixation*



or *fastening villi*). The trophoblast at the tips of the fixation villi undergoes marked proliferation to form the "*cell columns*," which are chiefly composed of Langhans' cells, and invade the decidua, thus uniting the tips of the fixation villi with the decidua basalis (Figs. 14 and 18). These *cell columns* gradually diminish, until towards the end of the second month they disappear, the tips of the fixation villi themselves becoming firmly attached to the decidua basalis.

Masses of trophoblastic cells lie free in the intervillous spaces attached to the ends of free villi, *i.e.* villi which are

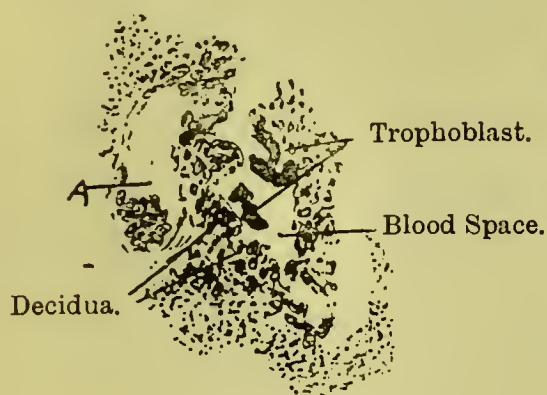


FIG. 19.



FIG. 20.

FIGS. 19 AND 20.—MICROSCOPIC SECTIONS, FIFTH WEEK OF PREGNANCY, SHOWING TROPHOBLAST AND VILLUS.

A. Blood Vessel opening into a Blood Space.

floating free in the spaces. These are the *cell nodes* or islands, which disappear, and are largely converted into fibrin during the first few months.

Trophoblastic cells are also arranged as a stratified layer resting on the decidua basalis to form the outer wall of the intervillous spaces. This is the so-called *basal ectoderm*, which is frequently retained till the end of pregnancy as a more or less continuous stratum.

At first villi project from the whole ovum into both the decidua basalis and capsularis, and thus intervillous blood spaces surround the whole ovum (Fig. 11), but as pregnancy advances and the distending ovum pushes the decidua capsularis before it, the blood supply of the decidua basalis becomes more abundant, while that of the decidua capsularis diminishes.

Thus the villi at the highly vascular decidua basalis grow luxuriantly like branching rootlets to form the *chorion frondosum* (Fig. 11), while those villi over the rest of the ovum attached to the poorly nourished decidua capsularis gradually atrophy, leading to the formation of the *chorion laeve*. By the time the decidua capsularis is in contact with the decidua vera early in the fourth month the intervillous spaces of the future chorion laeve are obliterated, and the villi are almost completely degenerated, forming hyaline bodies.

*The placenta at full time* (Fig. 15) is a flat, spongy body, dark red on section, more or less round, 7 to 8 ins. in diameter,  $\frac{1}{2}$  in. thick at edge, and increasing to about  $1\frac{1}{2}$  in. thick where the cord is attached. Its weight varies from 12 to 20 ozs., and equals about one-sixth of the total weight of the foetus.

*The foetal surface* is smooth, whitish and shining from its covering of amnion, under which the blood vessels from the cord spread out in all directions over the surface of the chorion.

*The maternal surface*, where it separates, is dark reddish-grey, rough and spongy, and incompletely divided by furrows into 15 to 20 cotyledons or lobules, covered by a very thin layer of decidua. Each lobule corresponds to a villus, which, with its branches, completely fills it. The furrows are filled by mixed trophoblastic and decidual cells to form septa (Figs. 15 and 21), which do not reach as far as the chorion and have villi attached to them. Many of the septa show fibrinoid formation.

The *normal attachment* of the placenta is in the *upper uterine segment* above the retraction ring, and with equal frequency on the anterior or posterior walls, more rarely lateral, and still more rarely fundal.

*Any attachment* of the placenta to the *lower uterine segment* below the retraction ring is *pathological*, and called *placenta praevia*.

*Separation of the placenta* during the third stage of labour occurs in the spongy layer of the decidua basalis.

**Structure of Placenta.**—The human placenta (Fig. 21) is of the highest type of development, being a placenta haemochorialis discoidalis olliformis. The chorionic epithelium is in contact with the maternal blood (haemochorial); the villi are grouped to form disc-like structures or lobules (discoidal); and, lastly, the spaces, filled with maternal blood, in which the villi hang, are bowl-shaped (olliform) and roofed in by chorion, the



bowl-like surface to which the fixation villi are attached being formed by decidua basalis.

The structures entering into the formation of the placenta are amnion, chorion, chorionic villi, and decidua basalis; between the chorion and decidua are the intervillous spaces, in which villi float bathed in maternal blood.

*The amnion*, already described (p. 31), can be stripped off the chorionic surface of the placenta as far as the cord, and this not infrequently occurs spontaneously during the birth of the

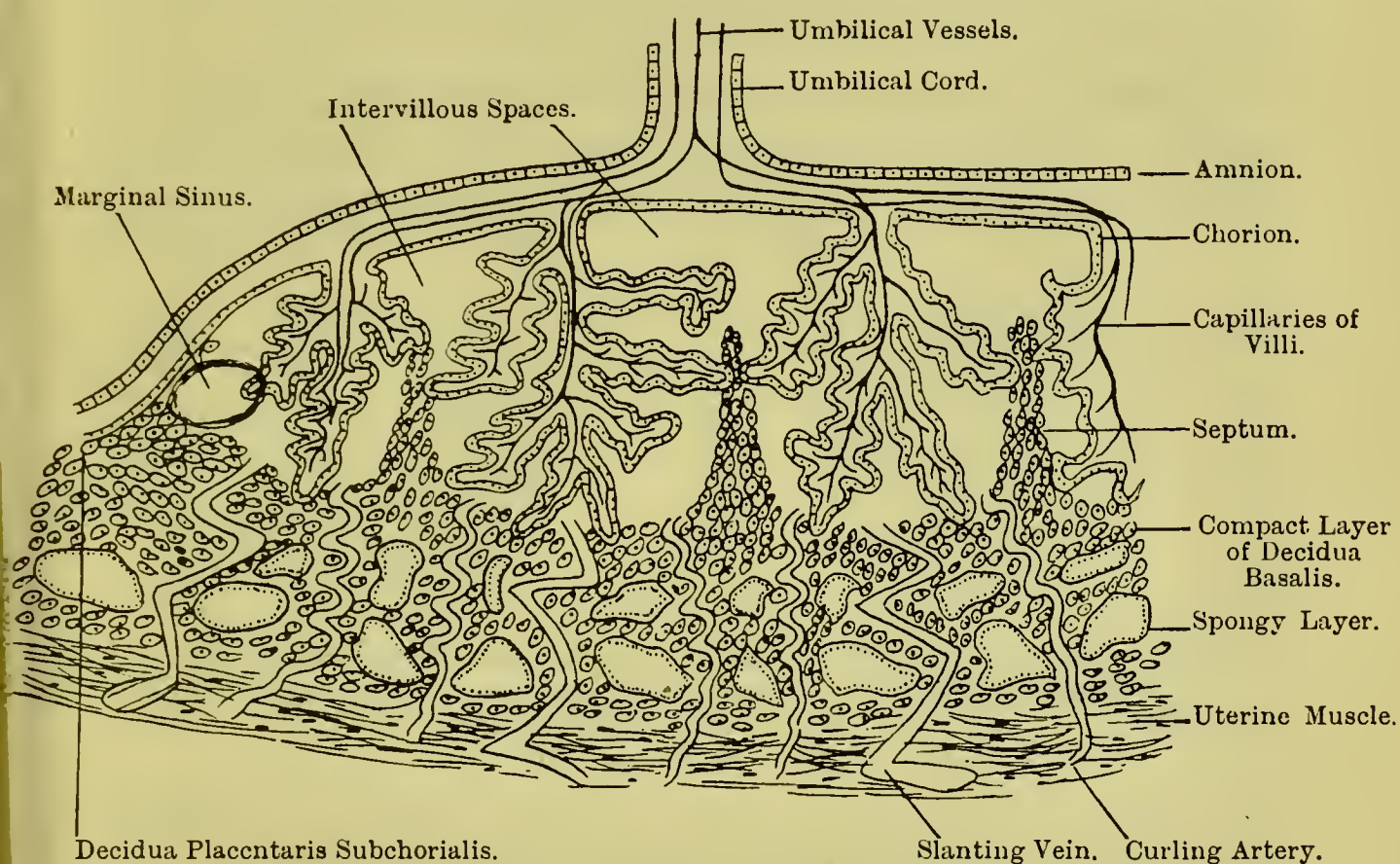


FIG. 21.—SCHEME OF PLACENTAL STRUCTURE SHOWING THREE COTYLEDONS.

placenta. It cannot be stripped off the cord without tearing, as developmentally the epithelium of the amnion is continuous with that of the cord, and the amnion ceases at the insertion of the cord on to the placenta. When the amnion is removed the umbilical blood vessels are seen coursing over the surface of the chorion, and projecting from its surface.

*The chorion* has been already described (p. 30). The placental portion is the chorion frondosum.

*The Chorionic Villi.*—Development is described above under “Development of Placenta.” From the beginning of the fourth month the villi persist only at the placental site, and project from the chorion frondosum (Figs. 14, 15 and 21). These

grow and increase enormously, and form the main bulk of the placenta as seen after labour. They are of three kinds :

(1) *Abortive*.—Non-vascular buds found only in the boundary zone at the placental margin.

(2) *Single Stem*.—Vascular villi with many branches hanging loose in intervillous spaces.

(3) *Racemose or greatly branched Villi*.—Thick stems with numerous branches forming the main bulk of placenta. Most branches hang free in the intervillous spaces, but some pass right across and are attached to the decidua basalis—"fixation villi."

*Structure of Villi* (Figs. 21, 22 and 23).—The villi have mucous connective tissue cores, which vary according to age. In the early months the cells are branching, and are separated

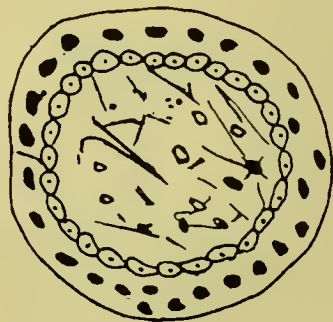


FIG. 22.—CHORIONIC VILLUS AT THIRD MONTH, SHOWING LANGHANS' LAYER.



FIG. 23.—CHORIONIC VILLUS AT NINTH MONTH, LANGHANS' LAYER ABSENT.

by a large amount of mucoid intercellular substance, but in the later months the cells become more spindle-shaped and closer packed together. The terminal branches of the umbilical vessels form capillary loops lying in the stroma. The epithelial covering of the villi is at first a double layer—the outer *syncytium*, a nucleated band of protoplasm ; the inner *Langhans'* cell layer, a single layer of nucleated cells. During the latter half of pregnancy Langhans' layer gets more and more indistinct, and by the end of pregnancy most villi only show a single layer of syncytium. Both layers are of foetal origin and developed from the trophoblast (see "Development of Placenta").

*Decidua Basalis*.—This has a compact, spongy and deep layer, as described on p. 27 (see Figs. 14, 15 and 21). Each lobule of the placenta is, as it were, a small placenta itself, containing one group or system of chorionic villi, which are like the branching rootlets of a plant spreading in all directions



from its main stem (Fig. 21). The compact layer of the decidua basalis along with the basal ectoderm forms the floor of the bowl-shaped space in which these villi hang, and the sides of the bowl are formed by the interlobular septa derived from the compact layer as well. These septa, which separate the numerous lobules, are incomplete, as they do not quite reach the chorion, which roofs in each bowl-shaped space. The decidua and chorion only meet at the edge of the placenta, hence the name, *decidua placentaris subchorialis* (Fig. 21).

*Intervillous Spaces and Vascular Relations.*—The intervillous spaces (Figs. 14 and 21) in which the villi hang to be bathed in maternal blood, and across which some extend to be attached to the decidua basalis, are extra-vascular in origin, and are simply parts of the great bowl-shaped space of each cotyledon lying between the chorion and decidua. The maternal blood passes into the intervillous spaces by “*curling arteries*” and returns by “*slanting veins*,” these blood vessels running obliquely to and from the spaces. The arteries enter chiefly in the region of the septa, and the veins leave more towards the middle of the lobule.

The *coronary sinus*, also called Meckel's or marginal sinus, is situated in the angle between the margin of the placenta and chorion laeve. It is not a continuous regular vessel, but is an irregular space not completely surrounding the placenta, and having gaps which communicate with the intervillous spaces.

In the uterine wall below the placental site there are numerous sinuses.

*Circulation in whole Placenta.*—The *impure foetal* blood goes by the two umbilical arteries to the villi capillaries, is there purified, acquires nutriment, and returns by the umbilical vein. The *maternal arterial blood* goes by the curling arteries to the intervillous spaces, receives the foetal impurities, gives up oxygen and nutriment, then returns as venous blood by the slanting veins and sinuses to the venous plexuses of the uterus and broad ligaments. The *foetal and maternal blood* do not communicate, but are separated by (1) capillary wall in villus, (2) stroma of villus, (3) epithelium covering villus.

*Functions of Placenta.*—These are (1) respiratory, (2) nutritive, (3) excretory. The placenta also acts as a filter between maternal and foetal blood.

The various substances necessary for the growth of the foetus, such as proteins, fat, sugar, salts and iron are taken from the maternal blood by a special action of the syncytium of the chorionic villi. The process is one of resorption associated with an activity on the part of the syncytium, which is partly constructive and partly destructive. The epithelium of the villi has the power of forming glycogen from sugar, splitting albumen into albumose, absorbing saponified fat and reconvertng it into fat globules, separating haemoglobin from the maternal blood corpuscles, and taking oxygen from the oxyhaemoglobin. Finally it has the power of passing effete matter from the foetal to the maternal blood.

*Placental Growth and Retrogressive Changes.*—The placenta reaches its greatest relative size in the fourth month, as it then occupies about half the area of the uterine cavity. It grows less rapidly than the uterus during the second half of pregnancy, and at full term occupies about one-fifth of the area of the uterine cavity. It also becomes flatter, and by the thirty-sixth week has nearly reached its maximum development. After this, retrogressive changes occur, and many sinuses below the placental site become impervious. Giant cells, which may also be found in the uterine muscle, are seen, but they are simply pieces of syncytium.

Necrobiotic changes occur in the decidua basalis, and a fibrinoid layer called *Nitabuch's fibrin layer*, and probably derived from trophoblast, marks the boundary between the maternal and foetal portions of the placenta.

A fibrinous layer, the *subchorial canalized fibrin*, is seen under the chorial plate. It is probably formed by successive deposits of fibrin due to the retarding of the blood stream in the roof of the intervillous spaces.

### 5. Liquor Amnii or Amniotic Fluid.

The foetus lies in the amniotic sac surrounded by a clear, yellowish, slightly alkaline or neutral, sterile fluid with a sweet fleshy odour. Sp. Gr. 1004 to 1012. The fluid averages 1 to 2 pints. At first clear, it becomes turbid, and may be greenish from meconium. It contains albumen, epithelial cells of epidermis, vernix caseosa, lanugo hairs, salts and urea.

**Sources.**—(1) Exudation through amnion from the maternal decidual capillaries. In the early months it has the appearance



and chemical composition of a serous exudate. (2) Foetus urinating, but this is not necessary, and can only occur in the later months. (3) Through foetal skin. (4) Through vessels of cord. The amnion plays a great, if not the chief, part in its production, but probably it comes from all four sources.

**Uses.**—1. It acts as a water-bed, saving the foetus from shocks.

2. It permits foetal movements.

3. It prevents adhesions of the foetal parts to one another, or of the amnion to the foetus. Such adhesions from deficiency of liquor amnii may cause various foetal deformities.

4. It maintains the normal heat of the foetus, and prevents a loss of heat by radiation.

5. It commences the dilatation of the cervix in the first stage of labour by forming the “bag of waters,” which acts as a fluid wedge.

6. It protects the child during the labour pains.

7. It acts as an aseptic douche at the end of the second stage of labour.

The liquor amnii is not necessary as a source of water supply or nutriment, since a foetus with occlusion of the oesophagus will develop to full time.

### 6. Foetus in Different Months of Pregnancy.

The first two weeks of pregnancy is the stage of the ovum and blastodermic vesicle. The 2nd to 8th week is the stage of the embryo. From the 8th week till full time pregnancy the future child is called the foetus. The length and weight vary considerably at the same age, but the following method of calculation is approximately correct and convenient:

*Calculated in centimetres and lunar months.* 3rd to 5th months, square the month; *e.g.*  $3 \times 3 = 9$  cms.,  $5 \times 5 = 25$  cms. 6th to 10th months, multiply the month by 5; *e.g.*  $7 \times 5 = 35$  cms., the length of a seven months' foetus.

*Calculated in inches.* 3rd and 4th months, multiply by 1. 5th to 10th months, multiply by 2.

One month old ovum, size pigeon's egg. Embryo, 7-10 mms.

Two months old ovum, size hen's egg. Embryo, about 1 in.

Head large, limbs present.



Three months old ovum, size goose egg. Foetus,  $2\frac{1}{2}$ – $3\frac{1}{2}$  ins. Head well-formed; fingers and toes well seen; navel closed; external genitals begin to assume sex type.

Foetus at end of 4th month. Length, 4 to  $6\frac{1}{2}$  ins. Can distinguish sex. Lanugo hair begins to grow over body.

Foetus at end of 5th month. Length, 7 to  $10\frac{1}{2}$  ins. Hair comes on head. If born it may breathe, but at once dies.

Foetus at end of 6th month. Length, 11 to  $13\frac{1}{4}$  ins. Month of greatest absolute growth, owing to rapid increase both in size and weight. Eyelids separate; vernix caseosa on skin; fat layer begins to form. If born alive it shows life, but soon dies.

Foetus at end of 7th month. Length,  $13\frac{3}{4}$  to 15 ins. Weight,  $2\frac{1}{2}$  to 3 lbs. If born alive it cries feebly. A few may live, but most die.

Foetus at end of 8th month. Length,  $15\frac{1}{2}$  to 17 ins. Weight, about 4 lbs. Skin red and covered with lanugo. Face wrinkled. Pupillary membrane has disappeared.

Foetus at end of 9th month. Length, 18 to 19 ins. Weight, 5 to  $5\frac{1}{2}$  lbs. Skin not so red. More fat.

Foetus at end of 10th month. Length, 19 to 20 ins. Weight, 6 to 8 lbs. At the beginning of this month nose and ear cartilages are still soft. The nails gradually reach the finger tips. Lanugo drops off and body form becomes rounder.

*The fully-developed foetus* is 19 to 20 ins. long, and weighs 6 to 8 lbs. Males are heavier. The proportion of births is 106 males to 100 females. The first child is lightest. The skin has a pale, rosy tint, and there is more or less vernix caseosa—a white, greasy material composed of sebaceous secretion and skin epithelium. The bones of the head are well ossified and in close contact at the sutures. The head is covered by dark hair about 1 inch long. The cartilages of nose and ears are well developed. The fingers and toes have well developed nails, projecting beyond their tips. The testicles are usually in the scrotum. The labia majora are well developed and in contact.

### 7. Foetal Skull.

The bones of the cranium being incompletely ossified, the spaces between them are completed by membrane, leaving the bones freely movable on one another, and allowing of head moulding during labour.

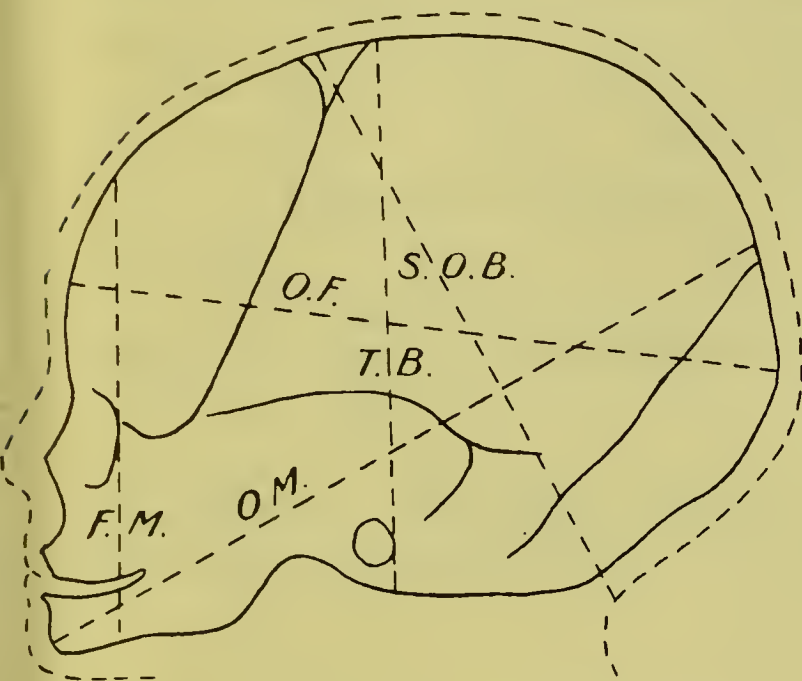


FIG. 24.

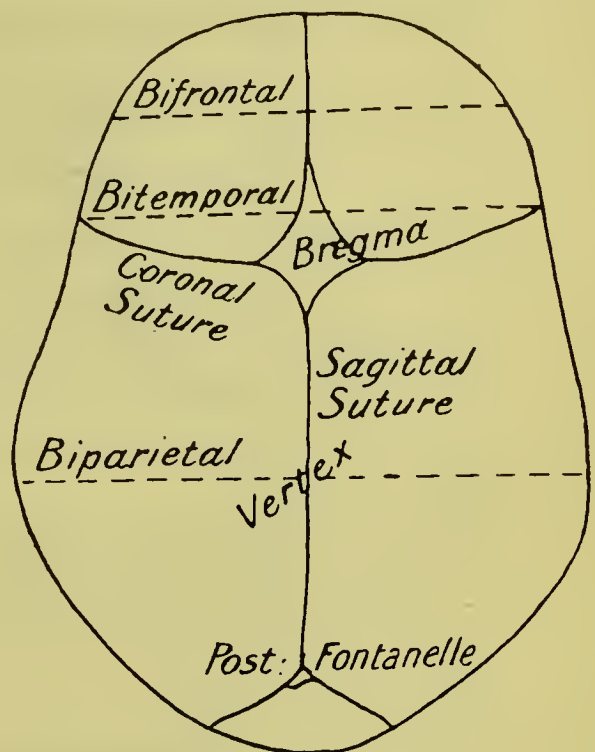


FIG. 25.

FIGS. 24 AND 25.—FOETAL SKULL, SHOWING DIAMETERS, SUTURES AND FONTANELLES.

#### Sutures.

1. *Coronal* between parietals and frontal bones.
2. *Frontal* between frontal bones.
3. *Sagittal* between parietal bones.
4. *Lambdoidal* between occipital and parietal bones.

#### Fontanelles.

1. *Bregma or Anterior Fontanelle*.—This is a lozenge-shaped space at the junction of the frontal, coronal and sagittal sutures, and has four angles of bone—frontals and parietals—projecting into it.

2. *Posterior Fontanelle*.—This is the triradiate sulcus at the junction of the sagittal and lambdoidal sutures, and has three angles of bone—two parietals and occipital.

3. *Posterior lateral Fontanelle*.—This is a small space at the junction of the squamous and lambdoidal sutures. (Felt in rare ear presentation.)

4. *Anterior lateral Fontanelle*.—This is a small space at the junction of the coronal and squamous sutures.

**Diameters of Foetal Skull** (measured by callipers).

(A) <i>Antero-posterior</i> .		Inches.
1. Occipito-mental, from tip chin to tip occipital bone, - - - - -	5	$(5\frac{1}{4})^1$
2. Supra-occipito mental, from tip chin to most distant point on vertex, - - -	$5\frac{1}{4}$	
3. Occipito-frontal, from glabella to occipital protuberance, - - - - -	$4\frac{1}{2}$	$(4\frac{1}{2})^1$
4. Sub-occipito-bregmatic, from junction back of head and neck to anterior angle bregma, -	4	$(3\frac{3}{4})^1$
(B) <i>Transverse</i> .		
1. Biparietal, between parietal eminences, -	$3\frac{1}{2}$	$(3\frac{3}{4})^1$
2. Bitemporal, widest parts coronal suture, -	3	$(3\frac{1}{4})^1$
3. Bifrontal, - - - - -	$2\frac{1}{2}$	
(C) <i>Perpendicular</i> .		
1. Fronto-mental, between level of frontal eminences and chin, - - - -	3	
2. Trachelo-bregmatic, between angle neck and chin and centre bregma, - - -	$3\frac{1}{4}$	

*Circumferences*.—1. Plane of occipito-mental, 16 ins.

2. Plane occipito-frontal, 14 ins.

3. Plane suboccipito-bregmatic, 11 to 12 ins.

Heads of males average  $\frac{1}{2}$  inch in circumference more than females.

## 8. Physiology of Foetus.

### ALIMENTARY SYSTEM.

**Nutrition**.—There are three stages in the nutrition of the ovum, embryo and foetus (see also “Development of Placenta,” p. 33).

1. *Embryotrophic Phase*.—In the first stages of early development, and before a definite circulation has begun, the ovum derives nutriment through the activity of its trophoblast. Maternal substances are absorbed from the dissolving decidua

<sup>1</sup> Recommended as American standard.



and from the extravasated maternal blood surrounding the embedded ovum. This phase merges through—

2. A *transition stage* during which the blood lacunae and primary villi develop, into—

3. The *haemotrophic phase* of placentation. The nutritive material is now entirely obtained from the maternal blood filling the intervillous spaces through the activity of the syncytium covering the true chorionic villi.

**Liver and Intestine.**—Meconium gradually collects in the large intestine. This is a tough, viscid substance of very dark greenish colour and faint odour. It is composed of intestinal mucus and cast-off epithelial cells mixed with liver secretion showing the activity of this organ. Lanugo hair and epidermic cells may also be found, showing that the foetus may swallow the liquor amnii, but, as already stated, the amniotic fluid is not required for purposes of nutrition.

Meconium is not expelled under normal conditions during intrauterine life, but it may occur if the child is asphyxiated.

#### URINARY SYSTEM.

The kidneys secrete, but their activity is slight, since the placenta removes the urinary substances from the foetal blood. Urine may be discharged into the liquor amnii, but is not a necessary though one possible source of the amniotic fluid.

#### SKIN.

The activity of the skin is shown by the presence of the vernix caseosa. This is a thick, whitish, cheesy substance adhering firmly to the skin, and composed of fat from the sebaceous glands mixed with cast-off epidermic cells and lanugo hairs.

#### CIRCULATORY SYSTEM.

The heart begins its activity about the third week. It is first heard through the maternal abdomen about the seventeenth to twentieth week. In the fully developed foetus it beats 120 to 140 per minute.

#### Circulation of Foetus in Utero.

The following is the foetal circulation from the third month till birth is completed and the first respiration occurs.

The *venous* blood goes by the two umbilical arteries to the placenta, circulates in the villi capillaries, becomes *arterial*,

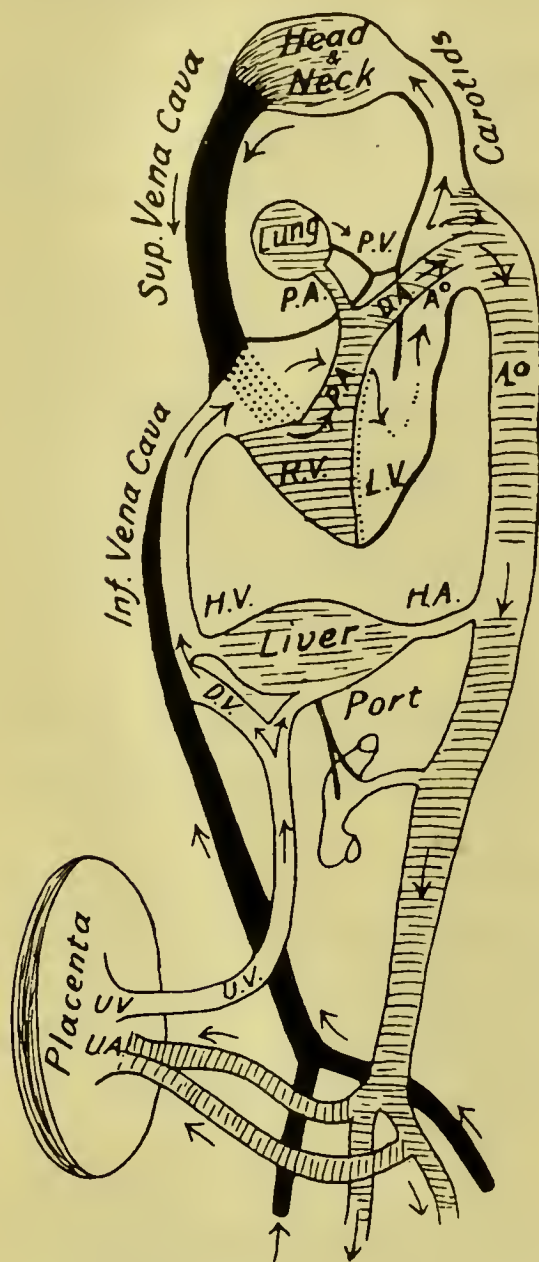


FIG. 26.—CIRCULATION OF THE FOETUS IN UTERO.

- A°. Aorta.
- D.A. Ductus Arteriosus.
- D.V. Ductus Venosus. A branch from D.V. joins the Portal Vein before it enters the Liver.
- H.A. Hepatic Artery.
- H.V. Hepatic Vein.
- Port. Portal Vein.
- P.A. Pulmonary Artery.
- P.V. Pulmonary Vein.
- L.V. Left Ventricle.
- R.V. Right Ventricle.
- U.A. Umbilical Artery.
- U.V. Umbilical Vein.

thence to the pulmonary artery (a little goes to lungs) and on through the *ductus arteriosus* into the aorta descendens. Here the venous blood is mixed with some arterial blood from the aorta ascendens. From the aorta it passes to the iliacs, where

returns by the umbilical vein, through the navel and along the edge of the suspensory ligament to the under surface of the liver. Here branches go to the left lobe of the liver, lobus quadratus and lobus spigelii. A part joins the portal vein, going through the liver to the inferior vena cava. The *most*, however, goes through the *ductus venosus* to the inferior vena cava. In the inferior vena cava the arterial blood is mixed with the venous blood from the lower limbs and abdomen. From the inferior vena cava it goes to the right auricle, and is guided by the *eustachian valve* through the *foramen ovale* to the left auricle, thence to the left ventricle, then to the aorta ascendens and by the large vessels to the head, neck and arms, some, however, passing on to the aorta descendens. The venous blood returns from the head, neck and arms by the superior vena cava to the right auricle. *Two streams* thus *cross* each other in the *right auricle*. Then the venous blood goes from the right auricle into the right ventricle,



some goes to the lower limbs. The circulation is completed by the venous blood passing by the internal iliacs to the hypogastrics and on to umbilical arteries and placenta.

#### CHANGES IN CIRCULATION AFTER BIRTH.

After the child is born, and the pulmonary circulation is established, the following changes occur: The *hypogastrics* obliterate in three or four days. The *ductus venosus* and *umbilical vein* become occluded during the first week. The *ductus arteriosus* closes gradually, and frequently is not imperious for several weeks. The *foramen ovale* does not permanently close for some time, it may be months; occasionally it remains more or less patent, leading to more or less grave circulatory disturbance.

### 9. Attitude—Position—Lie and Presentation of Foetus in Utero.

*Attitude* (Fig. 15).—This is the relation of the foetal parts to one another independent of the position of the foetus in the uterus. Normally all the foetal parts are flexed, and the back bent. The foetus thus occupies least room, and adapts itself to the egg shape of the uterine cavity. Abnormally there may be some extension, as with a face presentation.

*Position*.—This is the relation of a given part of the foetus to the mother, and is usually designated according to the direction of the foetal back, *e.g.* in left occipito-anterior or left sacro-anterior the foetal back is directed towards the mother's left and front. In face cases it is the relation of the chin to the pelvis.

*Lie*.—This is the relation of the long axis of the foetus to that of the mother, *e.g.* cephalic lie, podalic lie, transverse lie.

*Presentation*.—This refers to the part touched by the finger when examining per vaginam. In the *cephalic lie* there may be a vertex, brow or face presentation; in the *pelvic lie* a breech, knee or footling presentation.

The following description of the commonest presentation, the first vertex or left occiput anterior, gives an example of the use of these four terms:

The *attitude* of the foetus in the uterus is one of *complete flexion*; with the back bent forward and arched; head flexed,



with chin on chest; arms, hands and fingers all flexed, with arms crossed on chest; thighs, legs, feet and toes all flexed, with legs crossed. The *lie* is *cephalic*, the head being in the lower uterine segment and the long axis of the foetus corresponding with the long axis of the mother. The *position* is *left anterior*, the foetal back and occiput being directed towards the mother's left and front. The *presentation* is *vertex*, the examining finger passed through the cervix palpating the top of the cranium in the vertex region.

*Changes* in lie and position are frequent during pregnancy, especially in multiparae, hence the greater proportion of mal-presentations in premature labour.

**Cause of Preponderance of Cephalic Lie.**—The head presents in about 97 per cent. of all full time labours.

The cause is due to :

1. Weight of head.
2. Shape of Uterus.
3. Tension of uterine and abdominal walls.
4. Uterine contractions.

*Accommodation Theory.*—It is due to the accommodation of the foetal ovoid to the egg shape of the uterine cavity, the foetus being most comfortable and fitting most accurately when presenting by the head. If the foetus occupy another position, its cutaneous surface is irritated, giving rise to reflex movements of the limbs, and these in turn to uterine contractions. These combined tend to restore the head lie.

#### IV. Signs and Symptoms of Pregnancy.

**Minor Symptoms.**—These are numerous, such as a thin pinched look; chloasma uterinum, a brownish pigmentation especially on forehead; toothache; headache; dreams; salivation; pica, etc.

**Major Symptoms.**—1. *Amenorrhoea.*—This normally occurs during the whole of pregnancy, but there may occasionally be a menstrual-like flow during the first two months. The author had a patient who menstruated at her usual regular intervals throughout the whole nine months of three pregnancies. The exact significance of such haemorrhages has not been determined, and although occurring at what would have been a menstrual period they may be pathological.

2. *Morning sickness* usually occurs from the fourth or fifth week to the beginning of the fourth month. It is sometimes absent.

3. *Quickening*.—This refers to the time when the foetal movements are first felt. It begins from the seventeenth to the twentieth week, when the growing uterus comes in contact with anterior abdominal wall, which is sensitive to the movements.

**Signs.**—The only absolute signs are :

1. Seeing the foetal movements ;
2. Feeling the foetal parts ;
3. Hearing the foetal heart ;
4. Ballottement.

5. The pregnant uterus is the only abdominal tumour which shows rhythmical contractions.

(A) *Changes in Mammæ*.—From the *second* month the mammæ get gradually larger, firmer and more sensitive, with a feeling of prickling or fulness. As the skin stretches in the *later* months you can see blue veins showing through the skin, and *striae* form as the result of over-stretching. From the *third* month you can express the *colostrum* or mammary secretion from the nipple, and round the nipple see a broad brown to black pigmentation band, the *primary areola*. After the *fifth* or *sixth* month a fainter pigmentation, not so complete, forms round the primary areola. This is the *secondary areola*.

The *nipple* gets longer, moister, more sensitive and erectile. 10 to 20 Montgomery's *tubercles* project like papules on the primary areola. They are enlarged sebaceous glands.

(B) **Abdomen** (Fig. 27).

6th to 8th week. There is slight flattening and the navel is depressed. The uterus feels more anteverted.

3rd month. The uterus is anteverted, with the fundus at the level of the brim, and is usually only felt bimanually.

End 4th month. The fundus uteri is 3 ins. above the pubes, and may be felt in thin women. The abdomen begins to enlarge.

End 5th month. The fundus is about two fingers' breadth below the umbilicus, and the uterus is easily palpated and *contractions* felt. The umbilicus is shallower.



End 6th month. The fundus is at the level of the umbilicus. The foetus can now be palpated.

End 7th month. The fundus is two or three fingers' breadth above the umbilicus, which is now *flat*.

End 8th month. The fundus is midway between the umbilicus and sternum.

End 9th month. The fundus is near the tip of the sternum. The umbilicus *protrudes*.

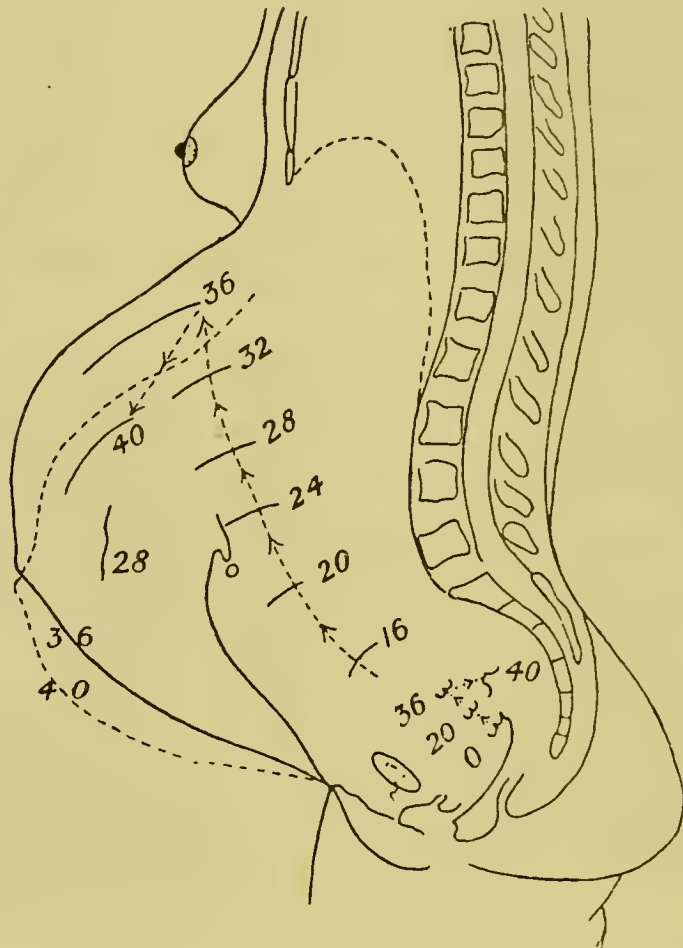


FIG. 27.—HEIGHT OF THE FUNDUS UTERI, POSITION OF THE CERVIX, AND DISTENSION OF THE ABDOMEN FROM THE SIXTEENTH TO THE FORTIETH WEEK OF PREGNANCY.

End 10th month. The fundus is at the same level as at the 8th month, but projects further forward.

The uterus *rises fully two fingers' breadth* for each *lunar* month.

A frozen section at *full time* shows that the fundus is 9 to 11 inches above the symphysis pubis, and opposite the first or second lumbar vertebra.

*Linea Nigra or Fusca*.—This appears during the 5th or 6th month as a brown pigmented line in the skin, running in the middle line from the pubes to the umbilicus, and sometimes higher.



*Striae Gravidarum* or *Lincae Albicantes*.—These appear after the 28th week, and are due to the stretching of the skin causing cracks in the deep layers. If new they are  $\frac{1}{4}$  to 1 in. long, and are seen as reddish, grey, or bluish glistening lines. Old striae from a previous pregnancy are whitish. They may be few in number or very numerous, covering the abdomen and even extending on to the groin or nates.

(C) **Vulva and Vagina**.—The *labia* are swollen and enlarged, and may contain varicose veins. The *vagina* is more vascular, softer, moister and easier explored after the 3rd month. A *port-wine colour*, or dusky violet hue (Jacquemier's), especially of the anterior wall and cervix, is seen after the 3rd month. It is due to venous congestion, and gets more marked as pregnancy advances.

*Pulsation* can be felt in the fornices from the 5th or 6th week onwards.

(D) **Uterus**.—*Positions* as above.

*Hegar's Sign*.—This is a valuable diagnostic sign during the 2nd and 3rd months. Bimanually you feel the antero-posterior thickening and boggy-ness of the corpus uteri, becoming hard during a contraction; also a peculiar compressibility of the lower uterine segment, so that the fingers almost seem to meet just above the cervix.

*The cervix* softens. Softness is first felt round the os as early as the 1st month. The whole cervix is markedly soft from the 3rd month onwards. After the 5th month the cervix *apparently* shortens, due to a flattening of the fornices, but no *true* shortening occurs till labour actually begins.

The whole uterus *softens* and has a doughy feel. Palpation notes the rhythmical *contractions*. The uterus gets hard, then softens again.

*Uterine souffle* after the 4th month. This is heard low down at the sides of the uterus as a blowing sound, and as pregnancy advances it may become audible over all the lower abdomen. It is due to the enlarged uterine blood vessels, and is also heard during the first few days of the puerperium. It is synchronous with the maternal pulse, as may be noted by holding the radial during auscultation.

(E) **Foetal Movements**.—1. *Active or Stirrage*.—These are felt by the mother as quickening after the 17th to 20th week.

Active foetal movements may be seen or may be felt by palpation from the 6th month onwards.

2. *Passive or Ballottement.*—(a) *Internal.*—This is practised through the vagina from the 5th to the 8th lunar month, and is quite diagnostic, as it shows a body is floating free in the distended uterus. The patient half reclines or sits on a couch. With two fingers in the vagina, push sharply against the lower uterine segment in front of the cervix. The foetus is thus pushed away, but falls down again on the finger with a gentle tap.

(b) *External.*—The patient lies on the side or back. A hand on each side of the uterus moves the foetus between them. The foetal limbs can be palpated in the later months.

(F) **Foetal Heart Sounds.**—These are usually heard from the 20th week onwards, rarely so early as the 17th week. The heart beat sounds like the muffled ticking of a watch under a pillow. At first it is heard just above the pubes, or at the fundus uteri, according to foetal position. Near the end of pregnancy the heart beats 120 to 140 per minute. In cephalic lie the point of maximum intensity is below the umbilicus; in pelvic lie, above the umbilicus, and to left or right according to the position of the foetal back to left or right. If the maternal pulse is rapid, feel the radial pulse while auscultating, to prevent mistaking aortic beats transmitted through the uterus.

*Facts obtained by Auscultation.*—1. Hearing the foetal heart is an absolute sign of pregnancy.

2. It shows the foetus is alive, but absence does not prove death.

3. The sound and character indicate the foetal vigour.

4. Size and sex? It is quicker in females and small foetuses.

5. Plural pregnancy. Hearing two different rates at two different parts of the uterus.

6. Position and presentation are confirmed by noting the point of maximum intensity.

(G) **Funic Souffle.**—This is a soft blowing sound, synchronous with the foetal pulse, and due to partial compression of the cord. It is rarely heard.

(H) **Gait.**—Women in advanced pregnancy, when standing, and especially when walking, hold themselves in a characteristic



manner, the upper part of the trunk being held back to balance the increased weight in the abdomen. The smaller the woman the more marked is this attitude.

TABLE OF SIGNS AND SYMPTOMS.

	Lunar Month	1	2	3	4	5	6	7	8	9	10
1. Amenorrhoea, - - -		×	×	×	×	×	×	×	×	×	×
2. Hegar's sign, - - -		×	×	×	.	.	.	.	.	.	.
3. Morning sickness, - -		?	×	×	×	.	.	.	.	.	.
4. Pulsation vaginal fornices, -		.	×	×	×	×	×	×	×	×	×
5. Mammae enlarge, - - -		.	×	×	×	×	×	×	×	×	×
6. Softness of vagina and cervix,		.	?	×	×	×	×	×	×	×	×
7. Primary areola, - - -		.	?	×	×	×	×	×	×	×	×
8. Express colostrum, - - -		.	.	×	×	×	×	×	×	×	×
9. Dusky hue vagina, - - -		.	.	?	×	×	×	×	×	×	×
10. Uterine souffle, - - -		.	.	.	×	×	×	×	×	×	×
11. Enlargement of abdomen, -		.	.	.	×	×	×	×	×	×	×
12. Ballottement, - - -		.	.	.	?	×	×	×	×	?	.
13. Quickening, - - -		.	.	.	.	×	×	×	×	×	×
14. Foetal movements felt, -		.	.	.	.	×	×	×	×	×	×
15. Uterine contractions felt, -		.	.	.	.	×	×	×	×	×	×
16. Foetal heart heard, - - -		.	.	.	.	×	×	×	×	×	×
17. Secondary areola, - - -		.	.	.	.	?	×	×	×	×	×
18. Linea nigra, - - -		.	.	.	.	?	×	×	×	×	×
19. Striae gravidarum, - - -		.	.	.	.	.	.	?	×	×	×
20. Apparent shortening cervix,		.	.	.	.	×	×	×	×	×	×

?=may begin so early.

### 1. Systematic Examination of Pregnancy.

In making a systematic examination of pregnancy the following points must be determined:

I. *Is the Patient Pregnant?*—Enquire as to the date of the last menses and the presence of major symptoms. Then examine the mammae, abdomen, vagina and cervix for the various signs enumerated above.

II. *In what Month of Pregnancy is she?*—Note especially the size of the uterus and height of the fundus, also the signs existing at the supposed date of pregnancy (see above table).

III. *What is the Position and Presentation of the Foetus, and is it Alive?*—Palpate and note the position of the foetal back, small parts, head and breech. Feel for foetal movements, and auscultate for foetal heart sounds over the foetal back. For the method see under "Management of Labour," p. 142.



IV. *Is she a Primipara or Multipara?*—The diagnosis is as follows :

PRIMIPARA.	MULTIPARA.
<i>Mammæ</i> .—Gland firm. Striae fresh and purple.	<i>Mammæ</i> pendulous. Old striae whitish ; new, purple.
<i>Abdomen</i> .—Wall firm. Striae new and coloured.	Wall flaccid, skin looser. Old striae white ; new, coloured.
<i>Uterus</i> .—Wall full of tone and relaxation incomplete.	Wall softer and completely relaxed when not contracting.
Child's head deep in pelvis near end of pregnancy.	Head higher up at brim or even above.
<i>Ballottement</i> .	More easily carried out.
<i>Perineum</i> .—Intact. Fourchette not torn.	Signs of tear of fossa navicularis, or part of perineum.
<i>Hymen</i> .—Torn only and not destroyed.	Destroyed (carunculae myrtiformes). Patulous ostium vaginae.
<i>Vagina</i> .—Walls rugose ; narrower.	Walls smoother ; more roomy. May see evidences of tear in one or both vaginal sulci.
<i>Cervix</i> .—Conical and longer. Os round with margin smooth and intact.	Shorter and more cylindrical. Os transverse and more or less fissured or torn.

## 2. Signs of Former Pregnancy in a Non-Gravid Woman.

These are only definite if a pregnancy has lasted to at least 7 or 8 months.

*Mammæ*.—Pendulous ; larger nipples ; dark areola ; old striae.

*Abdomen*.—Flaccid walls, loose skin, old striae.

*Perineum*.—Scar of old tear.

*Hymen*.—Carunculae myrtiformes.

*Vagina*.—Larger, smoother.

*Cervix*.—Transverse os and fissures.

*Uterus*.—Slightly larger and longer than in a nullipara.

**Differential Diagnosis.**—In early months from subinvolution, fibroid, etc. In later months from ascites, cystoma, fibroid, phantom tumour, etc. (See Gynaecology text-book.)

## 3. Duration of Utero-gestation.

We do not know the exact day of fertilization, and therefore cannot be certain as to the exact length of utero-gestation. We also do not know for a certainty whether impregnation

occurs shortly after the last menstrual period or during the pre-menstrual stage of the next expected period. It is also probable that the duration of gestation varies slightly in different women and at different periods of life. The length of gestation, as calculated from numerous observations, averages about 273 days, but for convenience it is usually reckoned as lasting nine calendar or ten lunar months, forty weeks or 280 days counting from the date of the last menstrual period.

The *earliest period of viability* is medically the end of the seventh lunar month, *legally*, the end of the sixth calendar month. The legal limit of protracted gestation is 300 days, although cases are recorded exceeding this. In Scotch Law a child is legitimate if born within 10 calendar months after the death or departure of the husband.

#### 4. Methods of calculating Probable Date of Parturition.

**Methods.**—1. *Nægele's*.—To the first day of the last menses add 7 days and 9 months.

2. *Matthews Duncan's*.—From cessation of last menses add 9 months and 3 days, or 5 days if February intervenes. This is the middle of the probable fortnight.

3. *Montgomery's*.—Add to any day within one week after the end of the last menses, 280 days. This is the most likely week.

*Calculation where pregnancy occurs during amenorrhoea*—

1. Count 273 days from a definite known coitus.
2. Reckon the day when quickening was first felt as mid term, and add 20 weeks, or  $4\frac{1}{2}$  calendar months.
3. Note the height of the fundus uteri in the abdomen.
4. Note the condition and position of the cervix uteri.
5. Note the distance from pubes to fundus uteri as measured by calipers. From the 20th to 36th week the distance in inches is approximately the age in lunar months.

#### V. Hygiene and Management of Pregnancy.

The patient should lead a healthy, natural life, taking plenty of outdoor exercise up to the very end of pregnancy. She should avoid late hours, as a sufficient amount of sleep is essential. Her bedroom should be large, and kept well aired day and night. Badly ventilated rooms and crowded assemblies,



where the air is likely to be vitiated, as in theatres, should be avoided. She should avoid carrying weights, and keep from all violent exercise, such as dancing, horse or cycle riding, hill climbing and the like.

*Clothing* should be light and warm, and not press unduly on abdomen or mammae. Closed, warm knickers should be worn to keep the lower limbs warm and protect the vulva from dust. The usual corset should be discarded after the third month, and a special loose corset worn. An old one may be altered to suit the purpose by being made to lace at both sides, and altered above to support, without pressing on, the enlarging mammae. A pregnancy belt is advisable if the abdomen is large and tends to be pendulous. Garters should be avoided, as they favour venous congestion of the legs and varicose veins.

*Cleanliness*.—A daily bath, and especially daily cleansing of the vulva, is necessary. If vaginal secretion is very copious, and causing discomfort, douching may be permitted if done with care. The lotion should be boiled water at a temperature of 98° F., with one teaspoonful of common salt or borax added to each pint. A syringe must not be used, as it injects too forcible a stream against the uterus. A quart douche can must be used, placed not higher than three feet above the patient, and a glass vaginal nozzle is preferable, freshly boiled every time before it is used.

*Food*.—This should be what she is accustomed to, as no alteration in diet is necessary.

*Bowels*.—These should be carefully attended to, as there is a great tendency to constipation, which gets worse towards the end of pregnancy. Simple means should be tried first, such as the use of cooked fruits and a glass of water taken the first thing in the morning and just before going to bed. If these fail, prescribe gentle laxatives only, such as castor oil, cascara, compound liquorice powder, taken at bedtime, or mineral water, such as apenta or Hunyadi Janos, taken half an hour before breakfast.

*Nipples*.—These should be washed daily, and the dry secretion gently removed. The surface may be hardened by the application of alcohol. If the nipples are small they should be pulled out daily by a gentle movement.

*Morning Sickness*.—If this is troublesome, prescribe a light, simple breakfast, such as a cup of tea and a piece of well-



toasted bread, to be taken in bed an hour before rising. Should there be a tendency to nausea, or sickness after other meals, the patient should lie down for an hour. The tendency to sickness frequently yields to such a simple remedy as half drachm doses of bismuth carbonate with two or three drops of ol. menth. pip., taken in water five minutes before food.

*Salivation.*—If this is excessive, try astringent mouth washes, and prescribe bromides internally.

*Headache, Toothache and Neuralgia.*—These often yield to such a powder as phenacetin gr. iv, acid acetyl salicyl gr. x, and caffein gr. j. If decayed teeth are a cause, they should be attended to by a dentist.

*Pruritus Vulvae.*—Itching of the vulva is not infrequent, and may be very distressing, interfering with sleep. The usual causes are the congestion of pregnancy and irritation of vaginal discharge. A local examination should, however, be made, to exclude pediculi and skin eruptions. The urine should also be examined, but do not mistake lactosuria, which is frequent and physiological, due to small quantities of milk sugar, for diabetes mellitus.

*Treatment.*—The vulva should be cleansed twice daily, and the vagina douched, as mentioned above, if the vaginal secretion is copious. A 2½ per cent. carbolic acid lotion applied with pledgets of cotton wool to the itching surface gives prompt relief. A simple ointment should then be applied, *e.g.* hydrarg. ammon. gr. x, zinci oxid. ʒi, vaselin. et adip. lanae hydrosi āā ʒiv. Cocaine or eucaine gr. viij may be added to this.

*Oedema of Vulva and Lower Limbs.*—This may occur independently of nephritis, but should it occur, on no account neglect to examine the urine for albumen. The blood condition should be improved by a generous diet, and administration of some preparation of iron. Should it become excessive, keep the patient at rest in bed, and if necessary bandage the limbs.

*Varicose Veins.*—These may reach a large size in labia and lower limbs, causing great discomfort. The lower limbs should be firmly bandaged before rising. The patient should rest frequently during the day, and she should be warned of the risk of one bursting even with a slight injury, and told how to apply compression in the event of a rupture, till medical assistance can be obtained.

*Urine.*—It is advisable to examine the urine for albumen once a month, and during the last three months of pregnancy once a fortnight.

*Pregnancy during Lactation.*—Should pregnancy occur during the time that the mother is suckling a former child, nursing must be stopped at once.

## VI. Bacteriology of Genital Tract during Pregnancy.

*Vulva.*—The vulva swarms with various germs, such as streptococci, staphylococci, the bacterium coli commune, and other aërobic and anaërobic bacteria, and is therefore to be regarded as septic and a source of danger during labour if not cleansed, as the germs will be carried into the vagina by the examining fingers.

*Vagina.*—The normal germicidal property of the healthy vaginal secretion is increased during pregnancy, so antiseptic douches should be avoided both during pregnancy and normal labour, so as not to interfere with it. The presence of pathogenic organisms is pathological, though accurate culture methods have demonstrated that pyogenic streptococci, diplococci, and the bacterium coli commune, are not infrequently present in healthy, pregnant women, especially in the lower part of the vagina.

*Cervix.*—Organisms may be found in the lower part of the cervical canal, especially if lacerations or erosions are present, but they are unable to penetrate the germicidal mucous plug into the sterile uterine cavity.

Prophylactic douching of a healthy vagina is not only not necessary, but is harmful, as it washes away the protecting mucus.



## PART III.

### PATHOLOGY OF PREGNANCY.

#### I. Spurious or Imaginary Pregnancy.

*Synonym.*—Pseudocyesis.

*Definition.*—The simulation of pregnancy in non-gravid women. It may occur at any time up to or even after the menopause.

*Cause.*—Neurotic. (1) Wives anxious to be pregnant. (2) Unmarried women who have run the risk, but dread pregnancy. (3) Women suffering from nervous symptoms about the menopause, who misinterpret abdominal distension and intestinal movements for the signs of pregnancy.

*Symptoms.*—The patient may have any of the symptoms and signs of pregnancy, such as amenorrhoea, morning sickness, supposed quickening, mammary signs, and gradually enlarging abdomen. Various symptoms may appear in a wrong order.

*Diagnosis.*—This depends on a careful examination aided, if necessary, by having the patient under an anaesthetic.

The abdominal wall may be very fat or may be much distended, but the distension is uniform; the abdomen moves normally on respiration, not being fixed at the lower part, the umbilicus remains retracted; there are no fresh striae; the whole abdomen is tympanitic to percussion, although thick fatty walls may cause slight dulness; and auscultation is negative as regards the uterine souffle.

Vaginal examination shows no port-wine colour, and the cervix is hard. Bimanual examination shows a non-gravid uterus of normal size.

Under an anaesthetic the abdominal distension will disappear if not due to fat.



The mammary signs are of no value, as they may occur apart from pregnancy.

*Treatment.*—Assure the patient that she is not pregnant, attend to the digestive organs, and prescribe tonics or anti-spasmodics such as valerian and asafoetida.

## II. Interrupted Gestation—Abortion or Miscarriage—Premature Labour.

**Premature Labour.**—This means expulsion of the foetus *after* the 28th week, when the child is viable, and before the 40th week or full time labour. The nearer the premature expulsion is to full time the more favourable it is for the child, though the laity sometimes have the erroneous opinion that a 7th month will live easier than an 8th month child.

**Abortion or Miscarriage.**—This means expulsion before the 28th week and before the child is viable.

*Periods.*—(a) Before the 16th week and before the placenta is fully formed. The whole or part of the uterine contents come away accompanied by more or less profuse haemorrhage from the torn decidual blood vessels.

(b) From the 17th to the 28th week. The placenta is now formed. The membranes present and rupture and the foetus is expelled first, followed later by the placenta and membranes as at full time.

Some prefer to limit *abortion* to the period before the 16th week, and *miscarriage* to the period between the 16th and 28th week, but this is an unnecessary distinction, as both terms mean the same thing, and the laity usually call all such cases miscarriage.

*Etiology.*—Most cases occur at the end of the 2nd and 3rd months at a date corresponding to a menstrual period.

It is estimated that at least 20 per cent. of all pregnancies end in abortion, and most occur with multiparae, since uterine disease, which accounts for a large proportion, is commoner in women who have already borne children than in women pregnant for the first time. As regards primiparae, excessive indulgence in sexual intercourse seems responsible for a considerable proportion of abortions in young married couples, though retroflexion is a frequent cause.

It is also estimated that about 7 per cent. of all pregnancies

end in pathological ova containing deformed embryos due to interference with the nutrition of the chorion from decidual endometritis. Nearly all of these are aborted early, with the exception of a few which develop further, it may be to full time, a monster being born.

The causes of abortion are numerous and difficult to classify, as more than one may be responsible, but a large proportion of the abortions are due to diseased conditions of the decidua interfering with the nutrition and further development of the ovum. These conditions of the decidua are due to both local and general causes, as detailed in the classification of causes.

The irritability of the uterus itself is also an important factor, since a slight traumatism or mental shock, or even a violent purge which would have no effect in one woman will readily produce abortion in another. On the other hand, so tolerant may the uterus be that a severe traumatism, even the accidental introduction of a uterine sound, may fail to cause abortion. In some cases the cause is not obvious, both clinical and anatomical examination proving negative so far as our present knowledge goes.

#### Classification of Causes.

1. Acute diseases causing fever, with a rapid rise to 104° F. or over is of itself fatal to the foetus, *e.g.* pneumonia, typhoid, measles, influenza, malaria, appendicitis, severe cases of pyelitis, etc. Although placental infection is possible, as has been shown in cases of typhoid, measles, etc., it is only occasionally that the foetus acquires the same infectious disease as the mother. On the other hand, toxins readily reach the foetus through the placenta, and prove fatal.

2. Syphilis in father or mother. The foetus may be infected at conception from either parent, but it may also be infected with syphilis at any time during pregnancy should the mother acquire the disease then for the first time. The more recently the disease was acquired by father or mother the earlier in pregnancy does the abortion occur.

3. Chronic diseases, *e.g.* nephritis, diabetes, cardiac disease, or lung disease leading to asphyxia of the foetus. Chronic nephritis leads to decidual haemorrhage and the formation of placental infarcts.



4. Traumatic, *e.g.* great exhaustion, severe exertion, lifting heavy weights, dancing, riding, injuries to abdomen, operations on genitals, laparotomy, hot foot or hip baths, excessive or violent coitus, especially during the early months.

5. Psychical, *e.g.* great emotion, mental shock, fright, etc.

6. Intoxications, *e.g.* phosphorus, lead, mercury, alcoholism, morphinism, carbonic acid poisoning.

7. Drugs, *e.g.* savin, ergot, aloes, quinine, etc., but they must be given in toxic doses, as there is no drug which directly kills the foetus without injuring the mother.

8. Local infection—acute gonorrhoea.

9. Pelvic conditions—cystoma of ovary, maldevelopment of uterus, uterine displacements, *e.g.* retroflexion and prolapse, endometritis, fibroids of uterus, severe lacerations of cervix.

10. Abnormalities of ovum and membranes. Amnion, *e.g.* oligo- or polyhydramnios, adhesions; chorion, *e.g.* inflammation uterine in origin and producing maldeveloped embryos, hydatidiform mole; placenta, *e.g.* diseases (infarcts, etc.), placenta praevia; cord, *e.g.* knots, torsion.

11. Foetus—malformations; plural pregnancy.

12. Criminal, by instruments or drugs.

#### Pathology of Abortion before Sixteenth Week.

The abortion may be *complete* or *incomplete*.

*Complete or Typical*.—The whole contents of the uterus down to the spongy layers of deciduae basalis and vera are completely expelled. This occurs in *two* ways:

1. The ovum with attached deciduae first separates at the decidua basalis and is driven towards the cervix, pulling the decidua vera after it, separation being aided by the collection of blood behind the gradually detaching decidua basalis.

2. The decidua vera is separated from below upwards, and the whole contents of the uterus are expelled entire as an egg-shaped mass.

Bleeding occurs from the torn decidual vessels during separation and expulsion. The haemorrhage may be moderate or very profuse, and continues till the uterus is empty and retracted.

*Incomplete or Atypical*.—More or less of the uterine contents are retained. This occurs in four ways:

1. The decidua capsularis ruptures and the ovum alone,



covered by villi, escapes, leaving all the deciduae behind. This can happen in the first two months before the fixation villi have become firmly attached to the decidua basalis.

2. The ovum surrounded by the decidua capsularis and part of the decidua basalis is expelled, but the decidua vera remains behind.

3. The chorion and decidua capsularis rupture and with the other deciduae remain behind. The intact amnion, foetus and cord, which has torn off from its insertion at the chorion, are alone expelled.

4. The foetus alone escapes through a rupture in the amnion, chorion and decidua capsularis. Its loss may not be detected if it is expelled with blood-clot during the act of urination or defaecation, and this may lead to an erroneous view that the foetus has been absorbed.

The uterus remains large and soft, the cervix patulous, and haemorrhages continue. The portions may be thrown off in a few days or may be retained days or weeks until digitally removed.

**Mole Formation.**—When the abortion does not occur for some time after the cause which has killed the foetus, a uterine mole has time to form. It mostly affects ova not more than two months old, and as the foetus is often absent the laity call these moles false conceptions. Moles are of two kinds and are usually not less than 2 ins. nor more than 4 ins. long, and of a pear shape.

(a) *Blood Mole or Apoplectic Ovum.*—This is formed by repeated slight or slow progressive bleedings, and begins by haemorrhage into the decidua, leading to rupture of decidual vessels. The blood forces its way into the chorio-decidual space, partly destroying the chorion and villi, compressing them and distorting the ovum. The foetus is frequently absent, having become macerated and absorbed if death occur in the first six or seven weeks, or the embryo may have been a small monster; in such cases the amniotic sac is found compressed and empty. At a later date than this, when ossification has advanced, the absorption of the foetus is impossible, so it becomes macerated when it has been retained for some time, and is expelled in this condition. Rarely it mummifies.

*Mola Haematomatosa.*—Occasionally the interior of these moles, instead of being smooth, has an irregular nodular

appearance due to haematomata forming beneath folds of redundant amnion and chorion after the absorption of the liquor amnii in cases of early hydramnios.

(b) *Fleshy or Carneous Mole*.—The blood-clots are of older date and decolourized. The ovum is like a thick, fleshy mass, pear shaped and of a hard tough consistency.

Under normal conditions, after the death of the foetus, uterine contractions leading to abortion begin any time within four or five weeks, but these fleshy moles may be retained for weeks or months and even over a year.

**Criminal Abortion in Early Months**.—Though cases are recorded of the sound being passed without disturbing pregnancy, yet even a momentary introduction of an instrument practically invariably induces abortion. Injury to the deciduae, causing haemorrhage, however slight at first, is sufficient without perforating the ovum. Abortion begins on an average in about a week, but it may occur any time from two hours to six weeks or even longer after the introduction of a sound, this largely depending on the amount of injury caused. Ergot of itself does not induce abortion, but will promote uterine contractions after these have begun.

The great risk of the use of an instrument for criminal purposes is the introduction of sepsis, leading to septic abortion and septicaemia, with possible fatal results to the mother. Sepsis does not enter the closed uterus nor affect the healthy ovum under normal conditions, the cervical canal being closed by a germicidal plug of mucus, but if the ovum is killed and organisms are introduced by an instrument the contents of the uterus become putrid, giving rise to a foul discharge. It has been estimated that 80 per cent. of septic abortions are due to criminal interference.

#### **Symptoms, Diagnosis, and Prognosis of Abortion before Sixteenth Week.**

(a) *Abortion before or at the sixth week* is often mistaken for a profuse menstruation. The uterine contents are expelled entire or in fragments with blood-clot, and are thus overlooked. The cervix dilates little.

(b) *Abortion, sixth to sixteenth week*.—1. *Haemorrhage* is usually the *first sign*, and is moderate or profuse, continuous or comes in gushes, or is expelled in clots.



2. *Pain* is felt in the back or over the sacrum, also colicky pain in the lower abdomen, due to uterine contractions. Pain may be slight, as in multiparae, or severe and recur at very short intervals, as is usual with a first pregnancy. *Occasionally* pain begins before the bleeding.

**Varieties of Abortion.**—These are :

1. Threatened.
2. Inevitable.
3. Incomplete.
4. Missed.

### 1. Threatened Abortion.

*Symptoms.*—The patient feels unwell, complains of pain in the back and has a discharge of bloodstained mucus or slight haemorrhage.

*Diagnosis.*—There is usually a typical history of amenorrhoea and other symptoms of early pregnancy, then a sudden onset of haemorrhage. Examination shows an enlarged antero-posteriorly thickened uterus and other signs corresponding to the duration of the pregnancy. Difficulty may at first arise when a woman, who has become pregnant during the amenorrhoea of lactation, regards the bleeding as a return of her menses. The large size, form and consistency of the uterus make the diagnosis certain, as usually the uterus is smaller than normal during lactation. If in doubt, regard it as a case of pregnancy and treat accordingly.

*Prognosis.*—With treatment haemorrhage may cease and pregnancy continue. A single profuse haemorrhage or a bleeding which continues for several days may not interfere with a continuance of pregnancy, if the blood effusion between the decidua and uterine wall is not too great and does not separate the ovum from the uterus. An apparently threatened abortion may become inevitable, shown by haemorrhage getting more severe, due to an extensive separation of the ovum from the uterine wall. *Certain signs* of actual abortion are uterine contractions, shown by colicky pain in the hypogastrium and commencing dilatation of the cervix.

### 2. Actual or Inevitable Abortion.

*Symptoms.*—Haemorrhage increases and the colicky pains get worse. The cervix opens, the ovum protrudes and is finally



expelled. When the whole uterine contents are expelled the pain and bleeding cease, showing the abortion is complete.

*Diagnosis.*—There is a history of early pregnancy, then a sudden onset of bleeding followed by pain. Only occasionally does pain begin before haemorrhage shows itself.

Examination shows a large, thickened and boggy uterus which feels hard during a contraction. The diagnosis is still more certain if the cervix is found dilated and the ovum protruding.

*Prognosis.*—Bleeding in some cases may be very severe, but death from acute anaemia is very uncommon. Sepsis will rarely occur apart from imperfect attempts to empty the uterus, and carelessness as regards asepsis.

*How are you to determine when an abortion is complete?* When an examination of the abortion shows that the whole ovum along with the deciduae have been completely expelled, and when an examination of the patient shows that pain and haemorrhage have ceased and that the uterus is well retracted.

If any *portions* of the products of conception are *retained* in the uterus the abortion is *incomplete*.

### 3. Incomplete Abortion.

*Symptoms.*—There is a history of early pregnancy, then the onset of haemorrhage and pain, followed by “something coming away.” This may be chiefly blood-clot in which portions of the ovum are concealed and overlooked, and which may be of such a size that the patient thinks the abortion is complete. The haemorrhage, however, does not cease but continues constant, or recurring, indicating the retention of pieces of ovum and decidua.

*Diagnosis.*—If the abortion is recent and the history reliable, the diagnosis is easy, especially if a considerable portion is retained. Examination shows the cervix soft and easily dilatable or patulous to the finger; the uterus large and soft, getting hard during a contraction. The diagnosis may be difficult, and only cleared up by a diagnostic curetting, if a prolonged period has elapsed since the abortion, and if only little remains in the uterus, or if the abortion was in the second month and occurred without marked symptoms. An enlarged, soft, flabby uterus with metrorrhagia following a probable abortion requires a diagnostic curetting.

*Prognosis.*—(a) The retained portions may be thrown off in a few days with inter-current bleeding. (b) The uterus remains large and soft, with the cervix easily dilatable, and there is more or less continuous bleeding with blood-clot. (c) The retained portions may become septic and cause pelvic peritonitis, septicæmia and even death, but this is only likely to occur if unclean instruments or fingers have been introduced into the uterus. (d) Fibrin may deposit on a retained portion, forming a placental polypus, and giving rise to symptoms as from a fibroid polypus. (e) Neglected, incomplete abortion is a frequent cause of various gynaecological troubles such as endometritis, subinvolution, etc.

#### 4. Missed Abortion.

*Symptoms.*—There is a history of early pregnancy, then a supposed threatened abortion followed by prolonged amenorrhoea, so that the patient thinks she is still pregnant. The abdomen, however, does not enlarge, and other signs of advancing pregnancy are wanting. A fleshy mole has formed at the time of the threatened abortion, and is retained, or the foetus becomes macerated.

Some cases of retained mole are followed by a prolonged brownish discharge, which leads to a suspicion of myoma or other disease of the uterus.

*Diagnosis.*—In cases followed by amenorrhoea the size of the uterus is very much less than the reputed date of pregnancy should indicate. If the diagnosis is uncertain at the first examination, then wait for one or two months, when the uterus will be found no larger. Cases followed by a brownish discharge will require digital exploration of the uterine cavity to make a diagnosis.

*Prognosis.*—The uterine contents may be retained many weeks or months before being expelled as a blighted ovum or fleshy mole with or without a macerated foetus. They may, however, be retained so long that they demand operative treatment. The author had a case in which an ovum and macerated three months' old foetus were retained for nearly a year with no other symptom than amenorrhoea. The cervix was so rigid that it had to be incised before the uterus could be emptied.



### **Differential Diagnosis.**

Haemorrhage from varix, fibroid and carcinoma must be excluded. Always exclude a possible tubal gestation before treating a supposed abortion. The expulsion of decidua with bleeding from the uterus might be mistaken for an early uterine abortion, and if misdiagnosed, and the uterus wrongly treated, might lead to serious results by rupturing the gravid tube.

### **Prophylaxis.**

When abortion occurs, search for a definite cause, and if found treat it.

Replace and support a retroflected or prolapsed uterus. Endometritis is a frequent cause, so the uterus should be curetted for this. A badly lacerated cervix requires repair. If no local cause is found, examine the mother as to possible diseases likely to cause death of the foetus, such as nephritis and cardiac disease.

If abortion is repeated, suspect syphilis either in father or mother, and if required, prescribe mercury and potassium iodide.

In habitual abortion, where no cause can be found, the patient should not become pregnant for a prolonged interval. If she become pregnant, try rest in bed, especially during the week or ten days corresponding to a menstrual period. She should avoid coitus, severe exertion, cold baths and hot sitz baths. Constipation must be prevented and bowels regulated by gentle laxatives.

When the patient repeatedly aborts after the sixth month, not due to any obvious cause, and syphilis is excluded, give potassium chlorate gr. xv to xx thrice daily from the fifth month to the end of pregnancy.

## **TREATMENT.**

### **1. Threatened Abortion.**

Absolute bodily and mental rest in bed, lying on the back, is essential, and order a light, easily digested, nourishing diet. Regulate the bowels by mild laxatives so that there may be no straining during defaecation. Examine for and correct



any displacement of the uterus, retroflexion being a frequent cause.

*Drugs.*—Tincture of opium in  $\text{m} \times$  doses is the most effective drug, and may be combined with viburnum prunifolium and hydrastis, or if preferred, morphia suppositories gr.  $\frac{1}{4}$  may be used instead. Small doses of ergot and strychnine are also effective. These should be given every six hours. The patient should stay in bed till all symptoms have ceased. Rest in bed for several days at the time of the next period is also advisable.

## 2. Inevitable Abortion.

Only interfere when danger threatens, as abortion often ends spontaneously. The *greatest danger* arises when an attempt is made to empty the uterus, and this is imperfectly done. *Haemorrhage* is the commonest indication for interference, and the *vaginal tampon* is the best method of treatment, as it checks bleeding, stimulates the uterine contractions, and does not interfere with the separation and expulsion of the ovum.

**Technic of Tamponade of Vagina.**—Place the patient in the cross-bed position. Thoroughly disinfect the vulva, and douche or cleanse the vagina. Take eight to twelve pieces of sterile cotton wool or gamgee about the size of the palm of the hand, soak in one half per cent. lysol and squeeze dry. Using two fingers of the left hand as a speculum, pack these pledgets round and over the cervix till all except the lower third of the vagina is tightly tamponed. The cessation of uterine contractions indicates the time to remove the tampons, as the ovum is by this time separated. In any case they must be removed in ten hours, and the vagina douched. If desired, the vagina is freshly repacked, but this should not be repeated a third time, as if the second tamponade fails interference is necessary. In most cases, after removing the tampons, the cervix is found open and the ovum protruding and easily removed, or the uterine contents are lying on the top of the plugs.

Vaginal tamponade may fail, and in most cases where it fails the bleeding is atonic, the ovum being already separated or largely so, but retained. In such cases empty the uterus with the finger.

**Technic of Digital Evacuation of Uterus.**—This operation must be completely done if once commenced, and must not be

attempted if the doctor is not in a position to thoroughly empty the uterus:

Chloroform is essential, especially for nervous women. Place the patient in the cross-bed position. Antiseptically cleanse the vulva and vagina, and again cleanse your hands. Pass the hand into the vagina and the fore or middle finger into the uterus, while the other hand over the lower abdomen steadies and forces down the fundus uteri, so that the uterine finger can reach all parts of the uterine cavity. With the back of the finger to the uterine wall separate and remove all adherent portions, the line of separation being through the spongy layer of the deciduae. The *finger* is the *only* instrument to be used in separating an abortion. A large curette should only be used finally if it is necessary to remove small pieces which the fingers fail to separate, but great care must be exercised, as the uterine wall is easily perforated. Finally douche the uterus. Haemorrhage stops completely and the uterus retracts when it is empty. If the abortion is septic, empty the uterus with the finger only and tampon the uterine cavity with sterile iodoform or bismuth gauze.

### 3. Incomplete Abortion.

*Recent Cases.*—Empty the uterus with the finger, as above.

*Older Cases.*—If the finger cannot enter the cervix, dilate and separate retained pieces with the finger. If the curette is finally used, very great care is necessary, as the uterus is more easily perforated than in recent cases. Rarely, severe haemorrhage persists after emptying the uterus. For this thoroughly tampon the whole uterus with sterilized iodoform strip gauze, which can be left for 48 hours.

### 4. Missed Abortion.

In the absence of symptoms the uterus may be left to empty itself, as this usually occurs spontaneously. The indications for interference are persistent brownish discharge, a purulent discharge, or the onset of febrile symptoms.

Even in the absence of symptoms the mental distress of the patient as to her condition may call for interference.

If interference is necessary, anaesthetize the patient, dilate the cervix and empty the uterus with the finger as described above.



**After-treatment.**

The patient should lie a week in bed. Douching is not necessary.

**Abortion, Seventeenth to Twenty-Eighth Week.**

**Mechanism.**—The membranes present, dilate the cervix and rupture, and the foetus is expelled, followed later by the placenta and membranes. Occasionally the intact ovum (membranes and placenta) is expelled entire as a globular mass with the foetus and liquor amnii inside.

**Treatment.**—Manage as with a full time labour.

**Premature Labour.**

The mechanism and management is the same as with full time labour, but remember the greater frequency of malpresentation.

**III. Ectopic Gestation or Extra-uterine Pregnancy.**

**Definition.**—The implantation and development of a fertilized ovum outside the uterine cavity. It is usually tubal, rarely ovarian. The certainty of primary abdominal gestation is still doubtful, though a few probable cases have been recorded.

The uterus, although empty, enlarges more or less and forms a decidua.

The varieties of ectopic gestation are :

**A. Primary.**

1. *Ovarian*—The fertilized ovum develops in a Graafian follicle.

2. *Tubal*.—The fertilized ovum develops in some portion of the tube ;

(1) Interstitial or tubo-uterine, *i.e.* in the uterine portion of the tube.

(2) Ampullar (majority of cases), *i.e.* in the tube proper.

(3) Infundibular, *i.e.* at the fimbriated end of the tube.

(4) Tubo-ovarian, *i.e.* at the end of the tube adherent to the ovary.



**B. Secondary.**

After rupture of the tube the ovum continues to develop.

1. Subperitoneo-pelvic or broad ligament pregnancy.
2. Subperitoneo-abdominal (further development of ditto).
3. Tubo-peritoneal or tubo-abdominal or secondary abdominal.

*Etiology.*—It may occur as a first pregnancy, but is most usual in multiparae between the ages of 28 and 40.

Impregnation takes place normally in the tube, so that every pregnancy, as far as fertilization is concerned, is extra-uterine to begin with. The cause of ectopic gestation is therefore due to some condition which prevents the fertilized ovum reaching the uterus, or favours its embedding in the tubal mucosa or even in a Graafian follicle.

**Mechanical Obstruction to Passage of Fertilized Ovum.**—

1. Salpingitis, causing adhesions of contiguous folds of tubal mucosa with one another, and leading to the formation of false diverticula, into one of which the ovum passes and sticks. This is regarded as the commonest cause, and gonorrhoea is credited with being responsible for most cases.

2. The tube may be narrowed by a stricture from adhesions, undue flexion or the pressure of a myoma. Experimental ligation in rabbits has failed to produce ectopic gestation.

3. Arrested development of the tube, which shows the twistings of the foetal condition.

4. The ovum passes into a natural diverticulum in the tube wall or into the "cul-de-sac" formed by an accessory tubal ostium, and there embeds itself.

5. External migration of ovum. The fertilized ovum crosses from an ovary to the tube on the opposite side, and being now too large to pass through the isthmus, sticks, and embeds itself.

*Webster's theory.*—Decidual reaction occurs on a portion of the tubal mucosa in which the ovum embeds itself.

*Ovarian Gestation.*—A spermatozoön enters a Graafian follicle through the site of rupture, and fertilizes an ovum while still attached to the follicle wall.

**Ampullar Tubal Pregnancy.**

This is the most frequent variety.

*Pathology.*—The uterus enlarges, and a decidua vera forms just as in normal pregnancy. When the embryo dies this

decidua is thrown off in pieces or as a cast of the uterus with uterine haemorrhage.

*Tube.*—Some hypertrophy of the muscular coat occurs, and the blood vessels enlarge as gestation advances. No true decidua forms, although clusters of decidual-like cells are seen in the gestation sac. The mucosa remains thin, so the embedding ovum eats its way through into the muscular coat, where it lies in a cavity practically shut off from the tubal lumen by the formation of a thin pseudo-decidua capsularis made up of connective and muscular tissue.

This capsule degenerates into fibrin by the eroding action of the embryonic trophoblast, and in most cases soon ruptures, allowing the ovum to escape into the lumen of the tube. In other cases it is stretched by the growing ovum till it fuses with the mucosa on the opposite side of the tube.

The placental site, where the ovum embeds itself, is a pseudo-decidua basalis formed of fibrin, connective tissue and ectodermal cells.

The ectoblast of the growing ovum converts the muscle fibres into fibrin, and opens into the blood vessels of the tubal wall.

Sometimes the fimbriated end of the tube becomes closed, so that, when haemorrhage occurs into the lumen of the tube, it distends, leading to the formation of a haematosalpinx.

As the ovum continues to develop the tube stretches and thins, and, with the exception of a few cases which may go on to full time, nearly all tubal gestations end in abortion or tubal rupture. Abortion is more frequent than rupture, as the pseudo-capsularis usually yields more readily than the more resistant tubal wall.

The majority of cases—70 to 80 per cent.—end during the first two months by intracapsular rupture into the lumen of the tube, so-called *tubal abortion*. The blood from the resulting haemorrhage may remain in the tube, but it is usually so copious as to trickle into the abdominal cavity through the fimbriated end of the tube and form a peritubal or retro-uterine haematocele. Less frequently the gestation ends during the first twelve weeks by extra-capsular or tubal rupture, the capsule and peritoneum on the free side of the tube tearing externally, so that the blood from the resulting haemorrhage passes directly through the seat of rupture into the abdominal



cavity, and, according to the amount, proves fatal or forms a haematocele. The following are the various modes of termination:

**1. Destruction of Ovum by Intra-capsular Rupture into Tubal Lumen.**

(a) **Tubal Mole.**—The villi erode the blood vessels, haemorrhage occurs into the tube, the ovum becomes infiltrated with blood and destroyed, forming a mole, and the embryo dies. An early embryo is absorbed; if older, it may mummify. A small mole is rounded in shape, and may be retained in the tube and become absorbed, or may abort into the abdominal cavity. Larger moles are ovoid, and usually lead to tubal abortion into

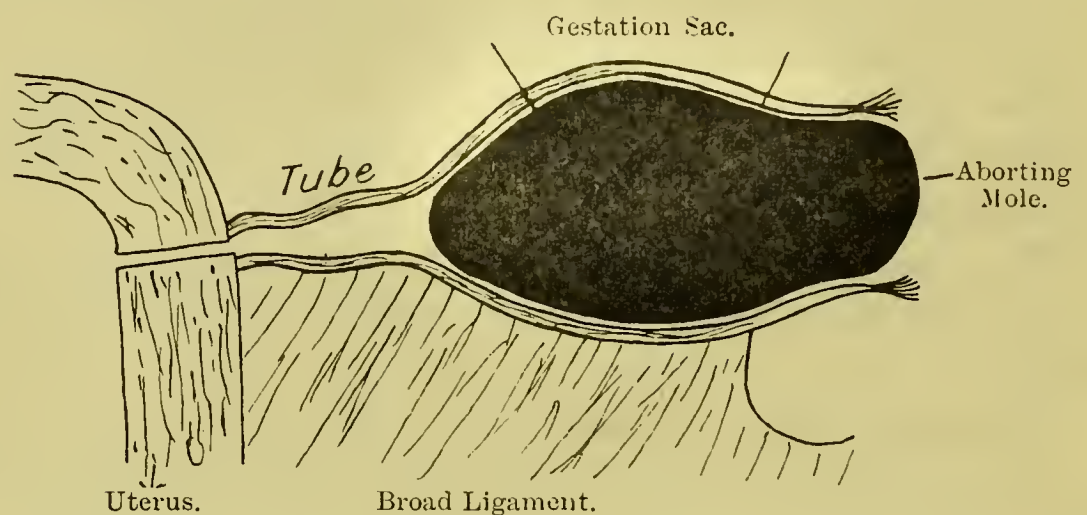


FIG. 28.—TUBAL MOLE ABORTING INTO THE PERITONEAL CAVITY AND PROTRUDING FROM THE DILATED OSTIUM OF THE TUBE.

the abdominal cavity unless the tube is closed. Abortion through the fimbriated end of the tube into the abdominal cavity is in all cases accompanied by haemorrhage, which usually forms a haematocele if the case is left to nature, and only rarely is fatal.

(b) **Tubal Abortion** (Fig. 28).—This is most likely to occur during the first two months, and may be *complete* or *incomplete*. The growing trophoblast and villi open up blood vessels in the tube wall, and the resulting bleeding completely or partially separates the ovum or mole. If separation is complete, the mole is forced by tubal contractions out of the tube into the abdominal cavity (*complete abortion*), when bleeding usually ceases. The effused blood clots and forms a haematocele. If separation is incomplete, and this is the more frequent occurrence, the ovum remains in the tube (*incomplete abortion*),



and bleeding continues. Tubal abortion may rarely be *fatal* from haemorrhage, but more usually the bleeding is slow, and a pelvic *haematocoele* forms (see under).

(c) **Haematosalpinx.**—If the fimbriated end of the tube becomes closed, further bleeding distends the tube, it may be to goose-egg size, and forms a haematosalpinx, the ovum being broken up and villi found amongst the blood-clot.

(d) **Pyosalpinx.**—Rarely suppuration occurs from infection of the tube contents.

## 2. Extra-capsular Rupture on Peritoneal Surface of Tube.

The tube ruptures on its peritoneal or free surface into the abdominal cavity, the blood from the resulting haemorrhage



FIG. 29.—UTERUS AND LEFT ANNEXA FROM A FATAL CASE OF RUPTURED TUBAL PREGNANCY AT FIFTH WEEK.

passing through the seat of rupture (Fig. 29). The mole or ovum may be completely discharged into the abdominal cavity if the tear is large, but as the tear is usually small the ovum remains in the tube and the haemorrhage continues from the torn blood vessels in the tube wall. Rupture usually occurs spontaneously within the first twelve weeks, but is occasionally the result of violence, such as a fall, strain or coitus.

Rupture is usually due to perforation of the tube wall by the eroding action of the growing villi, and when it does

result from violence or acute overdistension of the tube by haemorrhage into its lumen, the seat of rupture is already so thinned by the villi that the thin peritoneal covering readily bursts.

In cases operated on the author has seen villi protruding through the small opening.

**Further Course after Rupture.**—1. The rupture usually occurs at the site of implantation of the ovum in the tube.

(a) It may be fatal from free intra-abdominal haemorrhage, death usually occurring within twenty-four hours, as in the case shown in Fig. 29.

(b) The bleeding ceases, and the escaped blood forms a pelvic haematocoele, which absorbs ultimately if not removed by operation (Fig. 31). The patient recovers.

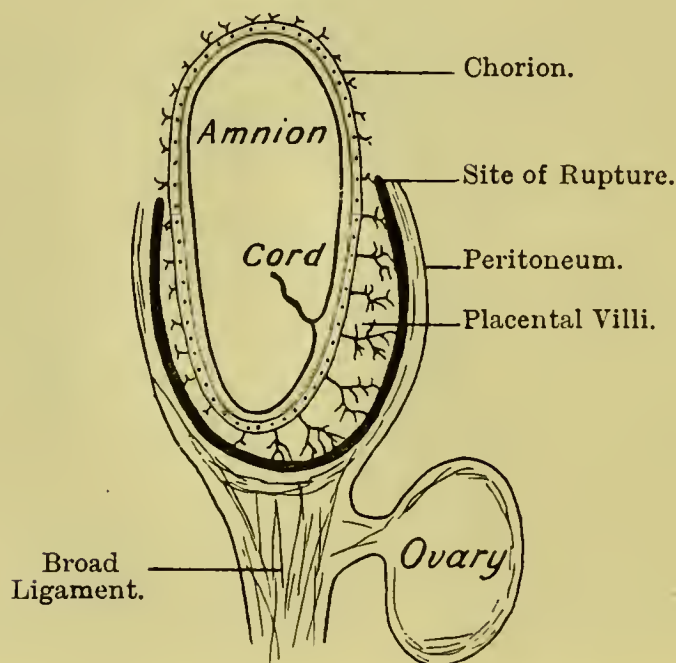


FIG. 30.—RUPTURE OF THE TUBE INTO THE ABDOMINAL CAVITY TO FORM A TUBO-PERITONEAL GESTATION.

2. The tube may rarely rupture at a spot opposite to the placental site. The ovum is implanted in the tubal wall beside the mesosalpinx.

It may thus form a *secondary abdominal* or *tubo-peritoneal gestation* (Fig. 30).

The foetus escapes, surrounded by its membranes, but the placenta remains in the tube uninjured. The pregnancy further develops, and may go on even to full time (see under).



**Pelvic Haematocoele and Haematocoele Retro-uterina.**—This is an outpouring of blood into the peritoneal cavity due most commonly to an incomplete or complete tubal abortion or rupture from an ectopic pregnancy. The haemorrhage is *intra-peritoneal*.

*Result of Haemorrhage.*—(a) There may be a copious free haemorrhage which rapidly proves fatal, the patient bleeding



FIG. 31.—RETRO-UTERINE HAEMATOCELE FROM HAEMORRHAGE DUE TO TUBAL RUPTURE OR ABORTION.

to death within twenty hours. (b) In most cases the haemorrhage ceases and the blood collects to form a haematocoele.

1. It may form an encysted retro-uterine tumour (haematocoele retro-uterina) bulging down in the pouch of Douglas and pushing the uterus to the front (Fig. 31).

2. In other rare cases the blood may collect in front and push the uterus downwards and backwards (haematocoele ante-uterina).

3. The blood may be localized around the tube (peritubal) or on the tube (paratubal haematocoele).

**Mode of Formation.**—Both the size and form of the haematocoele depend on the quantity of blood effused and the rate at which it escapes.

(a) A small quantity escapes, gravitates into the pouch of Douglas, where it clots, irritates the peritoneum, forms adhesions with bowel and omentum, and thus becomes encapsuled. Further bleeding may occur into this mass, enlarging it and forming a typical retro-uterine haematocoele (Fig. 31), forcing the uterus to the front and bulging down into the posterior fornix.



- (b) A similar condition may arise where a single copious haemorrhage occurs, the blood gravitating into the pouch of Douglas and becoming encapsuled, but not bulging so much.
- (c) Old haematocoeles are enclosed in a tough fibrin capsule like a cyst wall formed from peritonitic exudation and from blood fibrin.
- (d) The peritubal haematocoeles sometimes found at the side of the pelvis are formed by the repeated escape at intervals of small quantities of blood, each successive escape being added to the previous collection beside the tube.

### 3. The Tube Ruptures below between the Folds of the Broad Ligament.

This is an extra-peritoneal rupture of the tube below where it is uncovered by peritoneum, and is of rare occurrence. The contents of the tube and blood thus escape into the cellular tissue to lie between the folds of the broad ligament.

**Further Course after Rupture.**—1. The ovum is destroyed and the effused blood forms a haematoma, which usually absorbs but may suppurate.

2. The foetus, if too old to be absorbed, may mummify.

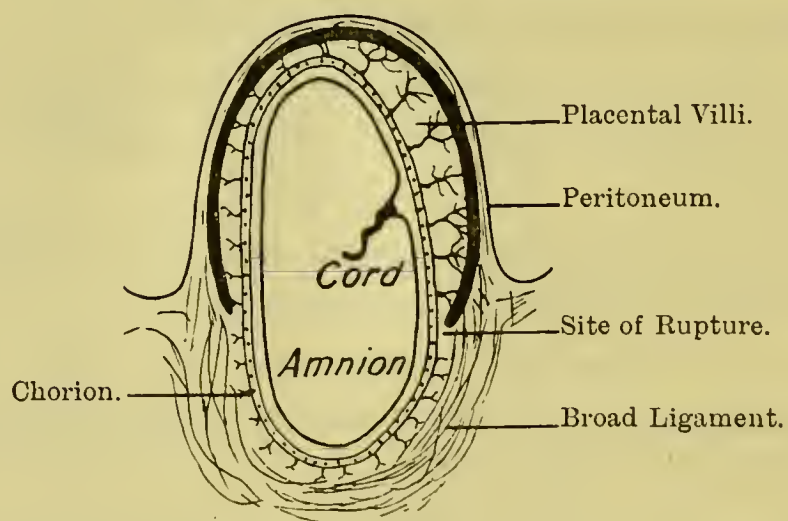


FIG. 32.—RUPTURE OF THE TUBE BELOW INTO THE BROAD LIGAMENT TO FORM A SUBPERITONEO-PELVIC GESTATION.

3. The foetus and placental site may not be injured, so the ovum may continue to develop as a *subperitoneo-pelvic* or *tubo-ligamentous* gestation (Fig. 32).

## CASES WHICH DEVELOP AFTER RUPTURE.

**1. Tubo-peritoneal or Secondary Abdominal.**

The foetus lies in a sac formed of its own membranes (Fig. 30), which become adherent to peritoneum and surrounding viscera (intestines, etc.). The tube may form a sac in which the placenta lies, or the placenta while attached to the tube may in its further growth become attached to pelvic floor, uterus, rectum, or even intestines.

The pregnancy may be interrupted at any time by the death of the foetus, or by rupture and haemorrhage, as in case shown, Fig. 33, but may reach full time.

If pregnancy reach full time, uterine contractions set in, the cervix dilates, and the uterine decidua is expelled with haemorrhage. The foetus now dies, the liquor amnii is absorbed, and the foetal sac contracts.

**Further Course after reaching Full Time.**—(a) There may occur inflammation and suppuration of the sac with fatal peritonitis, or with rupture of the abscess and the discharge of the foetus piecemeal through the abdominal wall or into bowel, bladder, or vagina.

(b) The foetus may mummify or form adipocere, or lime may deposit in the membranes—lithokelyphos—or on the surface of the foetus to form a lithopoedion. These may remain for years in the abdominal cavity without causing further disturbance, but on the other hand inflammation and suppuration may occur at any time.

**2. Subperitoneo-pelvic or Intra-ligamentary.**

The foetus lies in a sack formed by its own membranes between the layers of the broad ligament, and develops extra-peritoneally as a tubo-ligamentous gestation (Fig. 32).

*Further course.*—1. The peritoneum may rupture while the gestation sac is still pelvic in position.

(a) Haemorrhage results, which may prove fatal, or a large haematocele forms, in which the dead foetus is found.

(b) The foetus may die and mummify.

(c) The pregnancy may continue and develop as a *secondary abdominal* gestation, which may be interrupted at any time or go on to full time.



2. The pregnancy may remain subperitoneal, and, by pushing the peritoneum before it, grow into the abdomen as a *subperitoneo-abdominal* gestation.

(a) The gestation may go on to full time extra-peritoneally.

(b) Rupture of the peritoneum may occur, and the gestation sac lies in the peritoneal cavity to develop as a *secondary abdominal* gestation with above results.

### 3. Intra-tubal.

The tube may not rupture, but stretches more and more as the gestation advances, till it may reach full time with above results. This is very rare.

### Rarer Varieties.

I. *Interstitial or Tubo-uterine*.—The ovum develops in the interstitial portion of the tube in the uterine wall.

*Further Course*.—(a) The sac usually ruptures before the fifth month—(1) into the abdomen, with fatal results from haemorrhage; (2) into the broad ligament; (3) into the uterus.

(b) The gestation may go on to full time.

(c) The foetus may die “in situ” and mummify, etc.

II. *Infundibular*.—The ovum develops in the outer or fimbriated end of the tube.

III. *Tubo-ovarian*.—The ovum develops in a tubo-ovarian cyst, or in a tube (infundibular gestation) whose fimbriated end is adherent to the ovary. The foetal sac is therefore partly tubal and partly ovarian tissue.

IV. *Ovarian*.—The ovum is fertilized in a Graafian follicle, and engrafts on the lutein cells. Rupture occurs early.

V. *Cornual Pregnancy*.—The ovum develops in a rudimentary horn, which may not communicate below with the other half of the uterus. It is not ectopic, but is apt to end fatally by rupture into the abdomen.

**Multiple and Repeated Tubal Gestation**.—A twin pregnancy can occur in one tube, or both tubes may be pregnant at the same time. Extra-uterine and intra-uterine pregnancy may occur simultaneously. The author had a case of twin uterine pregnancy with a single tubal pregnancy, the latter rupturing at the third month and calling for an emergency laparotomy, the abdomen being found full of blood (Fig. 33).



Hydramnios or hydatidiform mole may affect a tubal pregnancy.

Ectopic pregnancy may recur in the same patient.



FIG. 33.—EXTRA-UTERINE WITH TWIN UTERINE PREGNANCY IN WHICH RUPTURE OF THE TUBE OCCURRED AT THE TWELFTH WEEK. THE EXTRA-UTERINE FOETUS IS SEEN ATTACHED TO ITS PLACENTA. (AUTHOR'S COLLECTION.)

**Symptoms and Diagnosis in Early Months.**—While the ovum is embedding itself and developing there are no symptoms to attract attention. The symptoms, as a rule, if not always, only arise when haemorrhage takes place into the tube lumen leading to the formation of a tubal mole, or when blood escapes from the tube into the peritoneal cavity as the result of tubal abortion or rupture.

The two *chief symptoms* are *pain* in the lower abdomen, and *uterine haemorrhage*. In rather more than half the cases there is a period of amenorrhoea varying from  $4\frac{1}{2}$  to 7 weeks, counting from the previous menses. One period has been missed, so that the patient thinks she is pregnant. In fewer cases two menstrual periods may be missed. In the other cases there is no previous amenorrhoea, and the pain and uterine haemorrhage begin from one day to three weeks after the cessation of the previous menses. In not a few cases the pain begins during what is regarded as a normal period, the uterine haemorrhage occurring at the expected date.

**Symptoms and Diagnosis of Tubal Mole Formation. No Haemorrhage into Abdomen.**—With or without a previous amenorrhoea as stated above, there is a sudden onset of severe pain in one ovarian region, which may spread to the hypogastrium. The pain may be colicky, come in repeated attacks, or be continuous. Simultaneously, or soon after, uterine haemorrhage begins, the discharge being usually brownish. It may be continuous from the first, or may show some irregularity before becoming continuous. In some cases the patient has attacks of colicky pains at intervals during several days before the uterine haemorrhage shows itself.

The uterine decidua is thrown off, and if it be in pieces it may pass unnoticed in the blood, but should it be expelled as a cast, it may be mistaken for an ordinary abortion, especially if the patient gives a history of missing one or two periods (see "Differential Diagnosis").

*Diagnosis.*—By bimanual examination the uterus is felt somewhat enlarged and soft, and is displaced if the tubal swelling is large. In the region of the tube, to the side of and well up and back in the pelvis, a doughy ovoid tumour is felt, more or less movable, and attached to the uterus by a pedicle formed of the undilated portion of the tube. If the gestation sac is near the uterine end of the tube, a sulcus but no pedicle is felt between the uterus and tumour. The uterine artery of the same side may be felt pulsating, but this is not a reliable diagnostic sign.

**Symptoms and Diagnosis of Tubal Abortion or Rupture, with Limited Intra-peritoneal Haemorrhage and Haematocele Formation.**—If the bleeding into the peritoneal cavity is slight, or occurs slowly, forming a small haematocele, it may cause only severe pain in the ovarian region associated with uterine haemorrhage.

If the bleeding is copious, there is sudden pain in the lower abdomen or iliac region, followed by faintness, collapse, clammy perspiration, nausea, and sometimes vomiting. Then come symptoms of loss of blood, anxious expression, pallor, paleness of lips, and rapid, weak pulse—the severity of these symptoms depending on the amount of blood lost. The *temperature* is *subnormal*. The effused blood gravitates into the pouch of Douglas, becomes encapsuled, and forms a haematocele.



The patient gradually rallies. In a day or two the temperature rises to 101° or 102° F., associated with local peritonitis. There is pain and tenderness over the lower abdomen, which lasts weeks or months, depending on the size of the effusion, and rapidity or slowness of absorption. Owing to pressure on bladder and rectum there is painful and frequent micturition and painful defaecation. *Should suppuration occur in the blood-mass*, fever, chills, sweatings, and other symptoms of abscess formation occur.

*Diagnosis.—Haematocele Retro-uterina.*—This is diagnosed when the effused blood becomes encapsuled. If very large, a tender tumour mass may be palpated or percussed in the lower abdomen. If smaller and limited to the pelvis, there is tenderness to palpation over the lower abdomen. *Per vaginam*, a very tender, rounded, *fixed* tumour is felt, filling the pouch of Douglas and extending to the sides of the pelvis, and pushing the cervix close behind the symphysis pubis. A *finger* in the *rectum* passes *behind* the mass and shows its rounded shape and elastic feel; it rarely fluctuates. *Bi-manually*, note the size of the mass, that it is ill-defined and irregular above, that it is quite immovable, and that the uterus is pushed to the front against the anterior abdominal wall (Fig. 31). In some cases the uterus may be in or behind the haematocele.

A *peritubal haematocele* is felt as a doughy swelling in the postero-lateral quadrant of the pelvis, and, according to its size, displacing the uterus more or less to the opposite side.

If *suppuration* occur, the mass increases in size, softens, and may rupture (see prognosis).

**Symptoms and Diagnosis of Sudden and Copious Intra-peritoneal Haemorrhage.**—The symptoms begin the same as above, but as the intra-peritoneal haemorrhage continues, and the acute anaemia gets more marked, the pallor increases, the lips and mucous membranes become pale, the pulse gets weaker and more rapid, the *temperature* is persistently *subnormal*, there is sighing respiration, dimness of vision, ringing in the ears, and thirst. The patient may die in eight hours, or she rallies slightly, then bleeding recurs and she dies usually within twenty hours.

A fatal result is usually due to tubal rupture. Tubal abortion is more favourable, as it generally ends in haematocele



formation. Sometimes, however, after a haematocele has formed, a fresh haemorrhage occurs, which may cause sudden enlargement of the haematocele with further severe symptoms of acute anaemia, or this fresh haemorrhage may prove fatal.

*Diagnosis.*—This is usually easy from the history and severe symptoms detailed above, the illness being so sudden in its onset and the collapse so marked with the rapidly progressing anaemia.

Chief reliance for a diagnosis must be placed on the history and symptoms, as it is only when much blood is effused that distension of the abdomen is noted and dulness percussed in the flanks as in ascites. In an early tubal rupture *nothing* can be noted on bimanual examination. In other cases an enlargement of the tube may be felt.

**Symptoms and Diagnosis of Rupture into Broad Ligament, with Haematoma Formation.**—*Symptoms.*—There is sudden pelvic pain and symptoms similar to those of intra-peritoneal haematocele, but the shock and collapse are less marked and the loss of blood is less.

*Diagnosis.*—Bimanually, an irregular doughy mass is felt in the broad ligament at the side of the uterus, which is pushed to the opposite side.

#### Differential Diagnosis.

1. From *haematoma*.—A haematoma is felt at the side of the pelvis in the broad ligament, and pushes the uterus to the opposite side.

2. From *peritonitis following an escape of pus* as from the rupture of a pyosalpinx, ovarian abscess or suppurating cystoma. There is sudden pain and collapse, but the pain is *intense* and the *temperature* at once *begins to rise* rapidly, and the signs are those of an acute pelvic peritonitis.

3. Pyosalpinx may closely simulate tubal pregnancy, where after being quiescent for a prolonged period it suddenly causes pelvic pain and irregular metrorrhagia. A pyosalpinx is low down in the pelvis, and both annexa are usually affected. A gravid tube lies higher in the pelvis and is unilateral.

4. *Incomplete Abortion.*—Uterine haemorrhage with discharge of decidua may be mistaken for this, so always examine for tubal enlargement in any supposed case.

5. Uterine pregnancy associated with a tubal or ovarian

swelling may easily cause a mistake. Avoid this mistake by taking an accurate history and making a careful examination to note the size of the uterus, which is only slightly enlarged in ectopic gestation.

6. Retroflexion of a gravid uterus may be mistaken for a retro-uterine haematocele in Douglas' pouch. Avoid such a mistake by noting all the symptoms and by a careful examination, especially as regards the position of the cervix.

The *cervix* of a uterus pushed to the front by a haematocele is easily reached, as it lies *close behind* the symphysis pubis, and the uterus is *palpable* in *front* of the mass. The cervix of a retroflected gravid uterus is *high up* and more difficult to reach, and is *continuous* with the mass filling the pouch of Douglas. The *urethra* is not pulled up and lengthened by the cervix as with a retroflected gravid uterus.

### Prognosis.

It is always grave. *A large effusion with bleeding unchecked* proves fatal usually within twenty hours.

Even after a haematocele has formed, a fresh haemorrhage may occur which proves fatal, so that if expectant treatment be adopted the patient must be carefully watched with a view to speedy operation if the haematocele enlarge.

*Haematocele*.—The blood absorbs quickly in some cases, in others very slowly, and it may take from two to six or eight months to disappear, the patient being an invalid all the time. It leaves dense adhesions fixing the uterus backwards (retro-position). As the mass gets smaller it becomes less sensitive, harder and nodular.

It may at any time suppurate, forming an abscess, and if not treated will usually rupture into the rectum, rarely into the vagina, bladder, or abdominal cavity. Such cases are apt to prove fatal from peritonitis and exhaustion.

*Haematoma*.—The blood usually absorbs and leaves little trace behind. It is much less likely to suppurate than a haematocele.

### Treatment.

1. *Tubal Mole formed and diagnosed before Rupture or Abortion occurs*. Operate as soon as diagnosed, as one cannot tell when intra-peritoneal haemorrhage may occur. The tube is best



reached by the abdominal route. As the ovary is generally healthy it should be left, and only the tube removed by cutting it from the mesosalpinx, after ligating the ovarian artery at the infundibulo-pelvic ligament and uterine end.

2. *Rupture or Abortion has occurred and Intra-peritoneal Haemorrhage is active.*—If the patient is seen while intra-peritoneal haemorrhage is active, and she is in a fit state to operate, perform laparotomy as soon as possible, as delay may be fatal. Operate quickly by laparotomy. Clamp the broad ligament on each side of the gestation sac, clear out most of the effused blood (it is not necessary to remove it all when speed is so important), cut away the tube, ligate the blood vessels behind the clamps, which remove, then fill the abdomen with saline, and close. If the patient is in a state of collapse when seen, wait till she rally, as the additional shock of operation is fatal. When she has rallied, operate, but before opening the abdomen infuse saline into the median basilic vein, this infusion being continued during the operation.

3. *A Haematocoele has formed.*—When a haematocoele has formed the treatment is either operative or expectant. The method of treatment chosen depends on the condition and surroundings of the patient, whether the blood effusion is large or small, and whether it has occurred recently or is not seen for some time after it has formed. The ability to obtain the services of a skilled abdominal surgeon is also a factor in the choice of treatment.

*Expectant Treatment.*—In country practice far from assistance it may be necessary to adopt this from the first. The patient must be kept at absolute rest in bed, lying flat on her back. Little can be done to check the bleeding, but ice should be applied to the abdomen if obtainable. A hypodermic of morphia may also be given, but ergot is both useless and dangerous. Fortunately, in the large majority of cases bleeding ceases and a haematocoele forms, so that if operation is deemed advisable it can be arranged for and undertaken under favourable surroundings.

Expectant treatment may be adopted if the haematocoele is small, as it often absorbs rapidly, but such a case must be carefully watched, since a fresh haemorrhage may occur and may even prove fatal before there is time to operate.



If expectant treatment is adopted, but the haematocoele is found to be enlarging, laparotomy should be performed.

#### Indications for Operation.

1. Small haematocoeles which are found to be getting larger by fresh haemorrhage, or which are associated with a large tubal mole.

2. Large haematocoeles, especially if absorption is delayed, and pain and suffering continue.

3. A working class woman, as she cannot afford to be an invalid for many months when operation offers her a speedy cure.

The author prefers to operate in the large majority of cases, as the prognosis as regards operation is excellent, recovery is speedy, and the patient is saved a prolonged period of invalidism, extending to several months, with large haematocoeles.

4. If suppuration occur, open per vaginam, wash out to remove clots and drain.

*Treatment of Rupture into Broad Ligament.*—This is at first expectant, as if the ovum is destroyed a haematoma forms which may be absorbed. If pressure symptoms are present or disappearance is slow, open per vaginam, remove the blood and pack with gauze. If the ovum continue to develop, open per vaginam if possible, remove the foetus, and pack with gauze. After several days remove the placenta.

If it be necessary to operate per abdomen, as where the placenta is low down, or the gestation sac is well above the pelvic brim, open the sac, remove the foetus, pack with gauze, and stitch the sac edges to the abdominal incision. Wait for several days before attempting to remove placenta.

#### Secondary Abdominal Gestation.

*Symptoms and Diagnosis in later Months.*—(1) Signs and symptoms of pregnancy; (2) often slight uterine haemorrhage; (3) frequent attacks of abdominal pain due to peritonitis; (4) discomfort and pain from foetal movements and from stretching of adhesions; (5) emaciation and loss of strength; (6) bladder and rectal trouble from pressure.

If this pregnancy reach full term spurious labour sets in with uterine pains, haemorrhage and the expulsion of uterine decidual tissue.

*Diagnosis.*—The ovoid shape of the pregnant uterus is absent, and the tumour may be more transverse or to one side. Foetal parts are more easily felt, as only the abdominal wall intervenes. One may make out the enlarged uterus displaced to one side, and a sound introduced shows it is empty.

*Treatment.*—Do not wait till full time, but perform laparotomy over the sac as soon as diagnosed, and remove the foetus. If possible, remove the whole sac, but if this cannot be done owing to the great risk of uncontrollable haemorrhage, stitch the sac to the abdominal incision, and pack with gauze. Wait for several days before attempting to remove the placenta. Change the packing as required till the sac is closed.

#### IV. Affections of the Uterus and Annexa.

##### 1. Displacements.

(A) **Anteversion.**—This condition is also called pendulous belly, and occurs in multiparous women with a very lax abdominal wall. It begins in the latter half of pregnancy, and as the uterus enlarges it projects more and more over the symphysis pubis with the fundus directed forwards, or even downwards and forwards in very aggravated cases, causing a very marked projection of the lower half of the abdomen.

The uterus may also project as a hernial protrusion through a marked separation of the recti muscles resulting from a previous laparotomy.

*Treatment.*—Apply a firm broad binder or special pregnancy belt to keep the uterus in position.

(B) **Prolapse.**—The uterus usually replaces itself in the early months, but should it remain prolapsed and not be corrected abortion usually occurs.

*Treatment.*—Reposition is usually easy, but should there be difficulty owing to oedema, keep the patient at rest in bed for several days, when reposition will succeed. A pessary should be inserted to keep the uterus in position and worn till mid term.

Incomplete prolapse is sometimes associated with a great hypertrophy of the cervix, which becomes oedematous and projects at the vulva. The patient should be kept in bed for several weeks if necessary, and the vagina daily packed with gauze till the hypertrophy largely disappears.



(C) **Hernia.**—Hernia through an abdominal laparotomy scar is referred to above under anteversion. Hernia into the inguinal canal is exceedingly rare, and requires induction of abortion if reposition fail.

(D) **Retroversion or Retroflexion.**—The whole uterus is turned backwards, the fundus uteri lying in the pouch of Douglas. In retroversion the cervix looks forwards, or upwards and forwards. In retroflexion the cervix looks downwards and forwards.

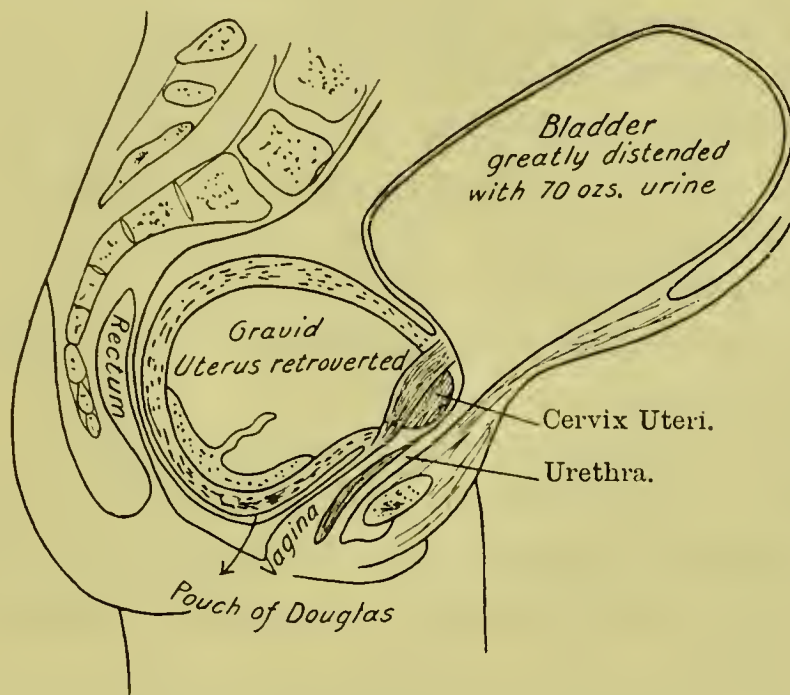


FIG. 34.—INCARCERATED RETROVERSION OF THE GRAVID UTERUS ABOUT THE FOURTH MONTH OF PREGNANCY.

*Cause.*—1. Pregnancy occurs in a uterus previously retroflected or retroverted.

2. It may be acquired during early pregnancy from a fall or strain acting on a uterus already forced backwards by an over-distended bladder.

3. The presence of a fibroid, especially of the anterior wall or fundus may displace the uterus backwards.

A fixed retroflected gravid uterus is rare, as, the tubes and ovaries being usually involved, conception is impossible.

*Result.*—1. The uterus may right itself. Spontaneous reposition is estimated to occur in nine out of ten cases.

2. It is a frequent cause of abortion.

3. It may become incarcerated in the pelvis at the fourth month of pregnancy (Fig. 34).

*Symptoms.*—Attention may be drawn to the condition in the



first three months by a feeling of downbearing, fulness in the pelvis, pressure on the rectum, and frequent urination.

*Treatment.*—Reposition is easy, and the uterus should be kept in normal anteversion by a pessary till mid term.

**Incarcerated Retroflexion or Retroversion.**—*Symptoms.*—Symptoms of *incarceration* do not show themselves before the fourth month, as it is only then that the uterus becomes large enough to lead to retention of urine. With a history of symptoms similar to those mentioned above there is—

1. *Sudden retention* of urine, and if the case be not recognized and the urine drawn off the *bladder* becomes *over-distended*. *Paradoxical incontinence* then occurs, marked by the escape of small quantities of urine at very short intervals, or even a continuous dribbling from the greatly over-distended bladder.

2. Difficult defaecation or absolute constipation, the bowels only moving if kept loose.

3. Pelvic pain from pressure, pain over the sacrum and a bearing-down feeling.

4. Nausea and vomiting are sometimes present.

**Diagnosis.**—1. The sudden onset of the above symptoms in a woman with four months' amenorrhoea and the other symptoms and signs of early pregnancy suggest incarceration of a pregnant uterus.

2. A large fluctuating unilocular tumour (the over-distended bladder) is palpable in the abdomen, reaching as high as the umbilicus, or even higher (Fig. 34).

3. Per vaginam, a soft tumour (uterus) is felt bulging at the posterior fornix and filling the pelvis. The cervix is *high up*, just behind or above the symphysis pubis, and is difficult to reach, more so if the uterus is retroverted.

4. Now pass a gum elastic male catheter, and draw off the large quantity of retained urine (up to 90 ounces or more), when the abdominal tumour will disappear.

5. Bimanually note that the pelvic tumour is the retro-flected or retroverted pregnant uterus about the size of a four months' pregnancy.

**Differential Diagnosis.**—1. *Ovarian cystoma with pregnancy* and uterus pushed to front. A catheter empties the bladder and examination shows two separate tumours.

2. *Retro-uterine Haematoecle.*—The history points to a tubal rupture or abortion. The uterus is small and pushed to the

front, the cervix is easily reached, and the urethra is not drawn up by the cervix.

**Prognosis.**—1. The fundus may force down the perineum and lead to rupture of the posterior vaginal wall, but this is rare.

2. Pressure on the neck of the bladder obstructs the circulation and leads to haemorrhage and gangrene. The urine becomes infected and decomposes. As a result, sloughing of the bladder mucosa occurs.

3. Death may occur from

(a) Septicaemia of vesical origin.

(b) Rupture of the bladder due to necrosis.

(c) Peritonitis.

(d) Exhaustion or uraemia.

4. In rare cases, especially when the fundus is firmly adherent, pregnancy may continue by an upward growth of the anterior uterine wall. The posterior wall thus forms a cavity—posterior sacculation of the uterus—in which one pole of the foetus lies, leading to serious difficulty at full time labour.

**Treatment.**—Some cases will right themselves by simply keeping the patient in bed and drawing off the urine regularly. This is probably what happens where a hydrostatic bag placed in the vagina takes several days to effect reduction. It is, however, not justifiable to wait and see if this will happen, as reduction can usually be effected. The author, with an experience of many cases, has only once had to resort to laparotomy to effect replacement, the pregnancy thereafter going on to full time.

*Manual Replacement of Uterus.*—Place the patient in the dorsal position. A table on which the patient can be placed in a modified Trendelenberg position aids reduction. Empty the bladder and rectum. With two fingers in the vagina push the fundus upwards and to the side of the sacral promontory. When the fundus is elevated above the pelvic brim, pull it forward with the other hand placed on the abdomen, while the vaginal fingers push the cervix backwards and upwards.

If this fail, place the patient in the genupectoral position, pull down the cervix uteri with a volsellum, and push up the fundus sideways of the sacral promontory with the fingers either through the vagina or rectum.



If these methods fail, or cause too much pain, they will usually succeed if repeated with the patient under chloroform anaesthesia.

Should there be difficulty in passing the catheter to empty the bladder, pull down the cervix uteri with a volsellum, to relieve the traction on the urethra. Should exfoliation of the bladder mucosa prevent the use of the catheter, aspirate suprapubically.

*Hydrostatic Bag Method.*—A rubber bag filled with fluid is kept distended in the vagina. It is not to be recommended, as it is very painful, may take a week to act, and may cause abortion. Should attempts at reposition fail, and this will rarely occur except in cases of fixed retroflexion, two methods of treatment are left, viz. laparotomy and induction of abortion.

*Induction of Abortion.*—A sound is passed through the cervix to puncture the ovum and let the liquor amnii escape. If it is impossible to pass a sound owing to the position of the cervix, pass a small trocar, under the strictest antiseptic and aseptic precautions, through the posterior fornix and uterine wall, so as to reach the amniotic cavity and aspirate the liquor amnii.

The uterus may be emptied by a posterior colpo-hysterotomy, *i.e.* the cervix is split posteriorly till the uterine cavity is reached.

*Laparotomy.*—The abdomen is opened and the uterus pulled up by hand. This is necessary if the uterus is fixed by adhesions, as only by operation can they be separated. It may also be done if the patient is willing to risk operation instead of losing her child by abortion.

Laparotomy is contra-indicated if there is gangrene of the bladder.

## 2. Tumours of the Pregnant Uterus and Annexa.

(A) **Fibroids of Uterus.**—Interstitial or submucous fibroids usually cause sterility. Pregnancy may, however, occur, especially if the tumours develop towards the peritoneal surface of the uterus. During pregnancy fibroids increase rapidly in size, due mainly to oedema and only partly to actual growth. They become much softer and flattened out, losing their distinctive outline, so that they may be difficult to distinguish when pregnancy is well advanced. During the puerperium they decrease in size and become hard again.



*Influence on Pregnancy.*—They may lead to abortion or premature labour. They may cause retroflexion of the gravid uterus. If low down in the pelvis they may produce such severe pressure symptoms as to call for operation.

*Treatment.*—If there are no symptoms, allow the case to go on to full time. Artificial abortion is not justifiable, since a fibroid which seems likely to cause obstruction may become so elevated as not to interfere with labour.

Hysterectomy or myomectomy is only called for if there are pressure symptoms, and these cannot otherwise be relieved, as where the tumours are mainly pelvic in position.

(B) **Carcinoma of Cervix.**—Cancer of the cervix grows very rapidly during pregnancy, both haemorrhage and discharge from the growth being very profuse.

Unless the case is seen in such an early stage as to permit of the radical operation, the outlook is hopeless.

*Influence on Pregnancy.*—The patient may abort, but in other cases the pregnancy may go on to full time.

*Treatment.*—If operation is at all possible, perform total hysterectomy, as the mother is the first consideration.

If operation is impossible, but there is a possibility of getting a living child, allow the pregnancy to go on to full time, as the child is now the first consideration.

Treat the haemorrhage and discharge by the local application of pure acetone twice a week, by antiseptic douches, and by packing with iodoform gauze.

(C) **Ovarian Cystoma During Pregnancy.**—A cystoma during pregnancy may give rise to no symptoms, and may thus not be recognized until attention is drawn to its presence by its large size. In other cases the patient may complain of pain or bearing-down sensation in the pelvis, when an examination leads to the discovery of the tumour. Torsion of the pedicle will cause the acute onset of abdominal pain.

*Prognosis.*—Abortion occurs in about 18 per cent. of pregnancies complicated by ovarian cystoma. Complications occur in about one-third of the cases, if not operated on, the most dangerous being torsion of the pedicle, rupture of the cyst, haemorrhage into the cyst, and suppuration, which give rise to peritonitis. (See further "Ovarian Tumour during Labour.")

*Treatment.*—There is no justification for an expectant line of treatment, and ovariectomy should be performed as soon as

the tumour is diagnosed. Operation does not cause a higher percentage of abortion than the tumour itself. The risk of operation is slight, while the dangers of expectant treatment, in order to let pregnancy reach full time, are very great.

### 3. Disease of the Decidua.

**Hydrorrhoea Gravidarum.**—This is due to a glandular decidual endometritis which may have existed in the non-gravid uterus, or has arisen during pregnancy. It is a frequent cause of abortion. The uterine glands are markedly hyperplastic, and the ducts usually persist. The decidua capsularis does not fuse with the vera.

*Symptoms.*—There is a profuse discharge of clear fluid from the glands of the decidua vera. It remains clear and free from blood, and may continue till the end of pregnancy.

*Prognosis.*—It does no harm to the foetus, and pregnancy may go on to full time.

*Treatment* is useless.

**Hydrorrhoea Amnialis.**—This is due to a more severe endometritis, and as the placenta is usually involved, a placenta circumvallata is formed. The membranes rupture from insufficient nourishment, so that the foetus may be partially or totally expelled through the membranes into the uterine cavity, producing an extra-membranous gestation.

*Symptoms.*—There is a discharge of watery fluid which differs from hydrorrhoea gravidarum in that it is mixed with blood during the last stages of the disease, and is always associated with rupture of the membranes.

*Prognosis.*—It usually ends in abortion or premature labour.

*Treatment.*—Nothing can be done beyond trying the effect of rest in bed and opium.

## V. Diseases and Abnormalities of the Ovum.

### 1. Diseases of the Amnion.

#### HYDRAMNIOS.

*Synonyms.*—Polyhydramnios. Dropsy of ovum.

*Frequency.*—1 in 150 pregnancies.

It is an excess of liquor amnii, which may amount to 30 pints or more. The accumulation of the excess fluid is usually gradual, but may in rare cases be rapid—acute hydramnion.



*Etiology.*—It is commoner in multiparae and in the latter half of pregnancy. The various causes are—

1. The foetal circulation is obstructed by stenosis, knotting or torsion of the cord; by liver or cardiac abnormalities.

2. It may occur with uniovular twins, hydrocephalus, monstrosities, etc.

3. It may be associated with diseases of the placenta and membranes. A large number are probably due to inflammatory changes in the amnion.

4. Excessive renal secretion.

The *symptoms* are those of pressure due to great distension, *e.g.* difficulty of breathing, oedema of legs and vulva, excessive vomiting, etc.

*Diagnosis.*—There is great abdominal distension, and a history of rapid enlargement. The uterus is rounded, while fluctuation and ballottement are unusually well marked. The foetal parts and heart are difficult to make out.

*Differential Diagnosis.*—1. From *twin pregnancy*. The uterus is harder and less cystic, and the foetal parts are easily palpated.

2. *Pregnancy and Cystoma.*—Two distinct tumours are felt, of which one is cystic while the other contains the foetus and shows uterine contractions.

3. From *cystoma*.—There are no uterine contractions. The signs and symptoms of pregnancy are absent, and a careful examination will distinguish the small uterus.

*Prognosis.*—There is a special liability to (1) pernicious vomiting; (2) albuminuria; (3) premature labour; (4) malpresentation; (5) uterine inertia at labour; (6) prolapse of the cord during labour; (7) post-partum haemorrhage.

*Treatment.*—A binder should be worn to support the over-distended abdomen, and the patient should rest as much as possible, but if pressure symptoms become urgent, puncture the membranes as high up in the uterus as possible. This leads to premature labour.

#### OLIGO-HYDRAMNIOS OR DEFICIENCY OF LIQUOR AMNII.

The cause is unknown.

If occurring early it may lead to amniotic adhesions, causing serious deformity. If occurring later the foetus is compressed, which may lead to minor deformities, such as club foot.



Deformities formerly thought to be due to deficiency of liquor amnii are now known to depend on faults in the nutrition of the early ovum.

In late pregnancy it is of no moment, but at labour the first stage will be tedious if there is not enough to form a good bag of membranes.

#### AMNIOTIC ADHESIONS.

These are formed in early pregnancy owing to deficiency of liquor amnii. The amnion becomes adherent to parts of the foetus, and as the amniotic sac is later distended these adhesions are drawn out to form bands which may cause such deformities as spontaneous amputation of the limbs.

### 2. Disease of the Chorion.

#### HYDATIDIFORM OR VESICULAR MOLE.

Numberless small cysts are formed in the course of the chorionic villi, varying in size from that of a pin's head up to

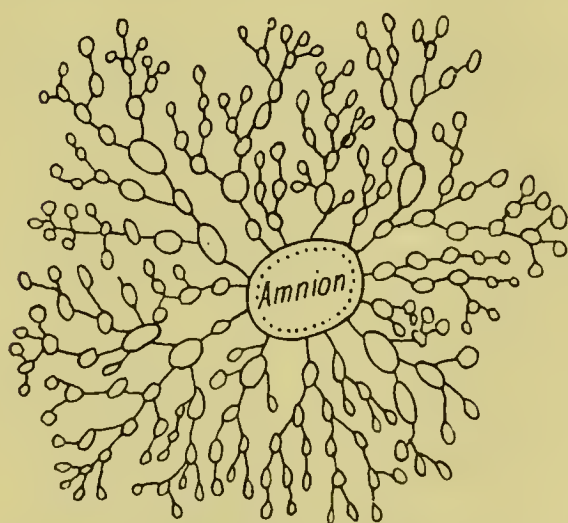


FIG. 35.—SCHEME OF FORMATION OF A HYDATIDIFORM MOLE.

cysts the size of a small grape. If the disease commence early the whole chorion with its villi is affected, and the embryo soon disappears, leaving a small, empty amniotic sac. The uterus is filled with a large mass like bunches of white currants (Fig. 35) attached to each other and to the chorion by thin pedicles, representing the undilated portions of the villous stems.

Growth is very rapid. If the disease commence late, then only the placenta (chorion frondosum) is affected.

**Pathology.**—The condition is due more to changes in the epithelium of the villi than in the stroma. Both the syncytium and the Langhans' layer of cells undergo profuse and irregular proliferation, penetrating the decidua, and even in some cases the muscular wall of the uterus. The blood vessels of the terminal villi disappear, and the stroma degenerates. The vesicles are probably due to oedema, as the fluid contains

albumen and only a little mucin, and thus corresponds more to a serous transudation.

*Etiology.*—Unknown. (1) Ovarian theory—It is due to a primary diseased state of the ovum, or the influence of lutein cysts of the ovary; (2) decidual theory—It is due to endometritis decidualis.

The *symptoms* are a rapid enlargement of the uterus, a three months' pregnancy reaching to the umbilicus, or higher, and a watery or blood-stained discharge or irregular haemorrhages. Sometimes vesicles escape. Sometimes there is excessive vomiting, and there may be albuminuria. Pain in the back and loins may be present.

*Diagnosis.*—The size of the uterus is excessive for the reputed date of pregnancy. If a suspected case is watched, rapid growth is noted. The uterus is more rounded, soft and doughy, with an absence of the usual tense, fluctuant feel. Various signs are negative, *e.g.* no foetal heart is heard, there is no ballottement, and no foetal parts are felt. A discharge of cysts makes a diagnosis certain. If abortion has started and the cervix is open, you can feel a peculiar soft, spongy mass in the uterus.

*Prognosis.*—Abortion usually occurs from the third to fifth months. There are special risks of peritonitis, sepsis and haemorrhage, and there are cases recorded of villi perforating the uterine wall and causing fatal intra-abdominal haemorrhage.

The haemorrhage during abortion may be very profuse, and may even prove fatal. The uterine wall may be so thinned by the eroding action of the diseased villi that there is a very great risk of perforating the uterus with the finger if the mole is manually removed.

Chorion-epithelioma most often follows this disease, so it should be carefully looked for in cases of metrorrhagia occurring after abortion.

*Treatment.*—If at all possible, leave the case to spontaneous expulsion, and only interfere if absolutely necessary, since the masses can only be removed piecemeal, haemorrhage may be excessive and portions of the mole are left behind.

If the case is not urgent, tampon the vagina, give ergot, and wait expulsion. If expulsion is delayed and bleeding is severe, threatening the patient's life, dilate the cervix and clear out the uterus. Use the fingers only, and guard against perforation of the uterine wall where the villi have thinned it. On no



account use a curette. After the uterus is empty, plug with gauze if required, and give ergot. Do not douche the uterus.

*After-treatment.*—Guard against subinvolution by ergot, iron and hot vaginal douches. Keep the patient under control for some months afterwards owing to the risk of chorion-epithelioma, and if metrorrhagia occur explore the uterus for possible growth.

### 3. Abnormalities and Diseases of the Placenta.

**Anomalies of Position.**—The placenta is normally attached to the anterior or posterior wall in the upper uterine segment. Rarely its insertion is fundal, a position which favours inversion of the uterus, especially if the cord is pulled upon. If any portion is attached to the lower uterine segment it is abnormal, and is called placenta praevia.

**Alterations in Shape and Size.**—*Large Size.*—The relative weight of the placenta to the foetus is 1 to  $5\frac{1}{2}$ , but it may occasionally be found much larger and heavier, especially if oedematous. The placenta may continue to grow after the death of the foetus if expulsion is delayed.

*Irregular Shape.*—Horse shoe, kidney shape, etc.

*Bipartite or Tripartite.*—Divided into two or three small placentae.

**Battledore Placenta.**—The cord is inserted close to the placental margin.

**Placenta Succenturiata.**—Accessory lobules form a small placenta separated from the main placenta, and branches from the umbilical vessels run across the intervening membranes. If it is not recognized at the birth of the placenta, but is left behind in the uterus, it causes post-partum haemorrhage. It is due to the persistence of vascular villi in the decidua capsularis.

**Placenta Marginata.**—A white band due to deposit of fibrin from decidual endometritis surrounds the placental edge on the foetal surface, the membranes being attached inside this band some distance from the actual margin of the placenta. If this band is raised by further fibrin deposit it is called *placenta circumvallata*. The nutrition of the foetus is interfered with, so that the children when born are undersized and weakly. Retention of the membranes may occur during the birth of the placenta, as the chorion readily tears from the placental edge.



**Calcareous Degeneration** from deposit of lime salts on the decidua basalis is frequent, and is of no importance.

**Tumours** are rare. Cysts may be found on the foetal surface, and are due to apoplexies, softened infarcts, or degeneration and oedema of a portion of the subchorionic connective tissue.

**Placentitis** may occur with syphilis or chronic nephritis, and leads to abortion, imperfect development of the foetus, and adherent placenta.

The maternal portion of the placenta shows endometritis with small cell formation which shrinks, compressing and destroying villi. An arteritis leads to obliteration of the blood vessels in the villi.

*Placental infarcts are very common*, and are seen as round or ovoid, greyish white patches, usually near the foetal surface. An endarteritis occurs in the vessels of the chorionic villi, resulting in coagulation necrosis, and fibrin formation, while the blood in the intervillous spaces coagulates and forms an organized thrombus. They occur in a very large proportion of cases of chronic nephritis, and also occur with syphilis and cardiac disease. If at all extensive the child is killed or is born weakly.

#### 4. Abnormalities of the Cord.

**Insertio Velamentosa.**—The cord is inserted into the membranes at a distance from the placenta, so that the umbilical vessels branch off and separate to run between the amnion and chorion before reaching the placental surface. Should the portion of the membranes containing the blood vessels present at labour, the foetal head may press on them, causing asphyxia, or the vessels may be torn when the bag of membranes ruptures, the child bleeding to death.

A *diagnosis* during the first stage of labour can only be made if pulsating vessels are felt in the presenting membranes.

*Treatment.*—Keep the membranes intact if possible till the cervix is fully dilated. Watch the foetal heart, and, if indicated, deliver rapidly.

**True Knots** are formed by the foetus slipping through a twisted loop of an unduly long cord. If these knots tighten the circulation is impeded, and the child is asphyxiated.

**False Knots** are local thickenings, due to twisting and doubling back of the vessels or to accumulations of Wharton's jelly.

**Anomalies of Length.**—The average cord measures 20 to 30 inches, but it may be unduly long or short. The author had a case where the cord measured 68 inches, with two true knots. A long cord favours coiling round the neck and limbs, causing an acquired short cord which may impede labour.

The cord may measure as short as 3 ins. and very rarely may be absent, the foetus lying close to the placenta.

An unduly short cord may impede labour, or rupture or may cause separation of the placenta or inversion of the uterus.

## 5. Disease of the Foetus.

### SYPHILIS.

A husband with primary or secondary syphilis may infect his wife and cause a syphilitic pregnancy.

A husband with former syphilis which has not been cured may not apparently infect his wife, yet she has abortions and premature labours time after time, so-called "syphilis by conception." It is difficult to understand how the infection occurs in such a case unless it be that the ovum at the time of impregnation is also infected by the *spirochaeta pallida*.

If both father and mother are syphilitic at the time of conception the foetus is syphilitic as a rule.

**Effect on Foetus according to Date of Syphilis.**—1. *Recent Cases.*—Early abortion occurs, or a macerated foetus is born before the seventh month showing osteo-chondritis syphilitica, an enlarged spleen, and gummata in the liver.

2. *Older Cases.*—The child is born prematurely either macerated, or, if alive, too feeble to live. It shows characteristic changes in all the organs as well as osteo-chondritis.

3. *Syphilis in Parent weakened by Time or Treatment.*—A full time living child may be born showing signs of syphilis at birth, such as pemphigus of palms and soles. These children die.

4. *Syphilis still further weakened.*—An apparently healthy child is born, though it is often poorly developed. In the course of several days signs of syphilis develop, such as coryza or snuffles, and fissures about the mouth and anus. The skin is dry, and eruptions appear. The voice is shrill and cracked. Most die.

5. Finally a healthy child is born and it remains so.



This, however, does not prove that the syphilis is cured, as a syphilitic child may result from the next pregnancy.

**Effect on Foetus where Mother acquires Syphilis during Pregnancy.**—If syphilis is acquired during early pregnancy the foetus is often infected, but it usually escapes if the mother is only infected in late pregnancy. The author had a case where the mother was infected at the seventh month of pregnancy, and although put under mercury treatment the child was syphilitic. It is extremely rare for a child to be infected during birth from syphilitic sores on the mother's genitals.

**Pathology of Syphilitic Foetus.**—The *spirochaeta pallida* is found in the blood and most of the internal organs.

*Osteo-chondritis* is the most constant sign of congenital syphilis, and is best seen at the lower end of the femur. Between the diaphysis and epiphysis runs a yellowish wavy line about  $\frac{1}{8}$  in. in diameter and sending off branches into cartilage and bone. The epiphysis is easily separated.

There is an excessive development of cartilage in the deepest layers of the epiphyseal cartilage, while calcification is delayed. The blood vessels do not develop rapidly enough, so the new tissue degenerates and round it granulation tissue forms.

The *liver* is increased in size and weight as the result of hypertrophic cirrhosis. There is a marked increase in the connective tissue surrounding the individual lobules and acini with here and there small areas of round-celled infiltration.

The *spleen* is enlarged from interstitial changes; the *pancreas* slightly enlarged.

The *kidneys* show cellular infiltration round the arterioles.

The *lungs* are large and heavy, of a reddish white colour and show indentations from the ribs. They may show interstitial inflammation, and the alveoli are filled with fatty epithelial cells. This is called white hepatization. Respiration is impossible.

The *epidermis* peels off in the macerated foetus.

The *placenta* is large and pale and, if the foetus be dead, often has a dull, greasy appearance. The villi become thicker and more club shaped. There is a marked decrease in the number of blood vessels which disappear almost entirely in advanced cases, due partly to endarteritis but chiefly to proliferation of the stroma cells, which lose their normal stellate appearance, becoming round or oval in shape and closely packed together.



**Prognosis of Syphilis in the Mother.**—Syphilis runs the same course as in non-gravid women. Condylomata on the vulva tend to spread rapidly, and form large masses, especially if the woman is uncleanly.

It is disputed whether the mother can be infected from a paternally syphilitic foetus. Colles' law is that she can nurse her own child, as she is immune even although she has shown no signs of syphilis.

**Rules as to Marriage of Syphilitics.**—Marriage should be forbidden till at least two years have expired after all signs of syphilis have disappeared. It is possible this opinion may be altered if treatment by Salvarsan, or "606," prove successful. If married, advise sexual abstinence for a similar period.

*Treatment.*—Both parents, if syphilitic, should be treated with mercury.

If a syphilitic child is born of an apparently healthy mother she should be treated with mercury during the pregnancy.

Syphilitic children should be treated as soon as born by mercurial inunction. The treatment of congenital syphilis by injection of the suckling mother with Salvarsan is not to be depended on, failures being recorded.

It is yet too soon to speak dogmatically on the value of injection of dioxydiamidoarsenobenzol or "606" (Salvarsan).

**Rules as to Nursing.**—The mother, even if healthy, can nurse her own syphilitic child; a healthy child born of a mother who has only acquired syphilis during pregnancy may be nursed by the mother, as the child is likely to be immune, but such a child must not be given to a wet nurse, as it might infect her.

## 6. Death of Foetus during Pregnancy.

**Pathology.**—A foetus which dies after ossification takes place, and this begins in the second month, cannot be absorbed, and if it is retained in the uterus it becomes macerated, the tissues being soaked by the liquor amnii and the fluid parts of the blood.

No putrefaction occurs, nor is gas formed, as no germs pass through the undisturbed membranes. If the liquor amnii become putrid there has been some defect in one or both foetal membranes through which germs from the vagina have gained entrance.

From its appearance it is called *foetus sanguinolentus*, and the large majority are due to syphilis.

The superficial layers of the skin rise in blebs and peel off in large flakes, giving the denuded parts a brownish red appearance.

The scalp is softened, and the cranial bones can be freely moved on each other as if lying loose.

The umbilical cord is oedematous and has a brownish appearance, the internal organs are oedematous, the tissues lose their structure, and the serous cavities are filled with blood-stained fluid.

The liquor amnii is turbid and discoloured, due to the escape of meconium and blood constituents.

In rare cases the dead foetus mummifies and shrinks, the tissues being quite dried as if tanned. This is well seen in the *foetus papyraceus*, when one foetus of a twin pregnancy dies, and is compressed.

*How long is the foetus dead?* It is impossible to say from the degree of maceration, as the process may be rapid or slow, but a clue may be obtained in the latter half of pregnancy from the mother's symptoms, though the mere history of absence of foetal movements is not reliable.

The appearance of the lens of the eye helps, as if it is coloured reddish the foetus has been at least two weeks dead.

*Symptoms and Diagnosis.*—In the *early months* foetal death can only be determined when repeated examinations show that the uterus remains stationary in size for several weeks. In the *later months* the mother may have a feeling of chilliness, physical depression, or languor; a sensation of weight in the abdomen, impaired appetite, dyspepsia, perhaps a foul taste in the mouth, with a furred tongue. She looks pale, and has a sallow colour. The abdomen does not enlarge progressively. The breasts become smaller and flaccid.

*Examination.*—Examination shows the uterus smaller than the computed date of pregnancy should make it. Repeated examinations show that the uterus is stationary in size or has become smaller; that foetal movements are never felt, and the foetal heart never heard. The mammae become soft and flabby. The diagnosis is certain if one can feel through the cervix that the cranial bones are loose as if lying in a flabby bag, indicating a macerated head.



*Prognosis.*—A dead foetus is usually expelled within a few weeks, but in rare cases it may be retained for months. If the foetus die in the early months it may be retained for weeks or months as a *missed abortion*. Much rarer is *missed labour*, where uterine contractions set in at full time but pass off, and the dead foetus is retained. Expulsion usually follows later. Serious danger arises if the membranes have been ruptured, as germs may thus gain entrance to the uterus and cause sepsis.

*Treatment.*—Interference is rarely necessary so long as the mother does not suffer. For the treatment of missed abortion, see p. 70. Missed labour should be treated by dilating the cervix and emptying the uterus. Should signs of sepsis arise, there must be no delay in emptying the uterus.

## VI. The Toxaemias of Pregnancy.

There are three clinically distinct conditions from which pregnant women may suffer, due to the retention in the blood of certain toxic substances, which arise in association with pregnancy. These are *albuminuria*, due to pregnancy kidney, which may end in *eclampsia*, *pernicious vomiting* and *acute yellow atrophy*. The nature of the toxins is unknown, and it is not yet determined whether they are allied or distinct, although the clinical types differ. The kidneys and the liver are the two organs mainly affected, and it would seem from the different pathological conditions found, and the extent to which these organs are involved, that these three diseases are distinct entities. The toxin which produces acute yellow atrophy may be allied to that which produces pernicious vomiting, but it differs from that of eclampsia, if judged by the lesions which it produces in the liver.

### 1. Albuminuria due to Pregnancy Kidney.

The toxins which produce albuminuria in cases which may end in eclampsia seem to be elaborated in the foetal portion of the placenta, and are of the nature of ferments and autolytic products, which are absorbed into the maternal circulation. The principal effect of these is an increased coagulability of the maternal blood and the activation of autolytic ferments in



other parts of the body. As a result, characteristic changes occur in the liver and kidneys, though the amount of liver involvement varies very much.

*Liver.*—The changes consist of thrombotic processes, which give rise to focal degeneration and necrosis, into which haemorrhage frequently occurs. The haemorrhages under the capsule give the liver a peculiar, mottled appearance. The lesion begins in the portal spaces, and invades the lobules from the periphery towards the centre.

*Kidneys.*—These show degenerative changes in the epithelium of the uriniferous tubules, such as cloudy swelling and fatty degeneration. There may also be a parenchymatous nephritis, so that pregnancy kidney does not differ pathologically from nephritis in a non-gravid woman.

Statistics show that from 5 to 7 per cent. of pregnant women pass albumen in considerable quantity.

*Symptoms.*—These vary from slight headache or nausea to symptoms of actual eclampsia. Most frequently there are headache, lassitude and a diminished secretion of urine, with, it may be, oedema of face or ankles. Headache may be severe, persistent and accompanied by disturbance of vision. In rare cases the patient may pass into a somnolent condition, which gradually deepens into coma, usually followed by death. The amount of urine is diminished, with a deficient secretion of urea, and showing more or less albumen and tube casts. Occasionally a marked diminution in urea is the only abnormality.

*Treatment.*—Owing to the importance of recognizing the condition early, to prevent, if possible, the risk of eclampsia, it is recommended to examine the urine of all pregnant women for albumen and urea at least once a month till the sixth month, after this every two weeks. The patient should certainly be warned to notify you whenever she suffers from headache, disturbance of vision or oedema. A small amount of albumen, with a normal output of urea, is of no importance. *Much albumen with diminished urea is serious*, so put the patient to bed, and give milk diet, diuretics, saline purges and hot pack. If the albumen diminish and the urea increase in quantity, the prognosis is good. If the condition get worse, then eclampsia threatens, so induction of premature labour is indicated (see "Eclampsia," p. 275).

## 2. Pernicious Vomiting—Hyperemesis Gravidarum.

The vomiting of pregnancy becomes excessive, all food is ejected, and in severe cases the patient even vomits on an empty stomach. Only a small proportion of cases are due to a true toxæmia, the majority being neurotic or hysterical in origin.

*Etiology.*—1. *Reflex* irritation from (a) uterine displacement, e.g. retroflexion; (b) endocervicitis, endometritis; (c) over-distension of uterus, e.g. twins, hydramnion, hydatidiform mole; (d) ovarian cystoma.

These causes are more or less doubtful.

2. *Neurotic or Hysterical.*—This is the cause in the majority of cases due to irritation arising from the pregnant uterus, and carried to the centre in the medulla.

3. *Toxæmia of Pregnancy.*—This accounts for a minority of cases due to an auto-intoxication associated with pregnancy. The toxin is allied to that of acute yellow atrophy, as it causes similar though less severe liver changes.

*Pathology of Toxæmic Vomiting.*—The chief lesion is in the liver, where we find, in cases examined after death, a degeneration and necrosis of the *central portions* of the liver lobules. This spreads peripherally, but never involves the portal spaces. The kidneys are only *secondarily* affected at the last, showing fatty degeneration and necrosis of the secretory portions, as albumen does not appear in the urine till shortly before death. The toxæmia causes a marked increase in the ammonia coefficient of the urine (*i.e.* the estimate of nitrogen put out as ammonia, which is normally 3 to 5 per cent.), while the total nitrogen remains approximately normal in amount. This is an important diagnostic between toxæmic and other causes (Williams).

*Symptoms.*—At first, part of every meal is vomited, then comes nausea between meals, and finally everything is vomited. The patient may even vomit on an empty stomach. She gets weak and emaciated from starvation as the case gets worse, and has an anxious expression. She has a dry, red tongue, foetid breath, sordes about the teeth and constipation. The pulse gets rapid and small, and may reach 140 or over before death. There may be fever. Finally, there come delirium, coma and death. Albumen and casts appear in the urine shortly before death.



*Diagnosis.*—Vomiting due to gastric ulcer or cancer, or other cause apart from pregnancy, must be excluded.

*Differential Diagnosis.*—In reflex and neurotic cases the ammonia coefficient is normal, 3 to 5 per cent. In toxaemic cases it is largely increased, reaching 10 per cent. or over.

*Prognosis.*—This is very grave in toxaemic cases, or if vomiting is continued past mid term. The patient may abort. Treatment may be difficult, and if one remedy fail another must be tried.

Excepting toxic cases, the cures are in all probability due to suggestion, and this is borne out by the almost immediate cessation of vomiting which will happen when a patient is transferred to a nursing home and isolated.

*Treatment.*—As so many cases are neurotic, the patient should be completely isolated from her family, and put at absolute rest in bed in a darkened room, preferably under the care of a skilled nurse. When expense is no objection, it is a great advantage to send the patient to a nursing home, so as to ensure complete isolation. It is also very important to obtain a psychical influence over the patient. The author has seen a speedy cure obtained by picturing to a neurotic patient the grave risk to her life of procuring abortion, and what a grief it would be to her to know she had lost what would be her first-born.

Give small quantities of cold liquid food, milk and soda, koumiss, meat juice, etc. If these are rejected, keep the stomach at absolute rest, and give nutrient enemata. Keep the bowels open by purgatives or enemata. Irrigation of the stomach may be tried, and repeated if it does good. Mustard sinapisms may be applied to the epigastrium. Saline enemata are very valuable, giving 10 ozs. every four hours.

Various drugs may be tried, but they may all fail, such as bismuth carb. gr. 30, with 2 drops peppermint oil, every four hours, cerium oxalate gr. 5 to 10, menthol gr.  $\frac{1}{6}$ , cocaine gr.  $\frac{1}{8}$  to  $\frac{1}{4}$ , tinct. iodi. ℥ 2 to 3, phenazone gr. 15, etc. Large doses of chloral and potassium bromide are as good as any, and they can be given per rectum if not retained.

Applications of adrenalin, 1 in 1000, to the nasal mucosa, or 10 drops internally, morning and evening, are effective in some cases.

In toxaemic cases an ammonia coefficient reaching 10 per cent. is an immediate indication for procuring abortion. In



emptying the uterus it is advisable to avoid chloroform as an anaesthetic, owing to its action on the liver.

In neurotic cases it will only occasionally be necessary to procure abortion as a last resort because all means of treatment have failed.

### 3. Acute Yellow Atrophy.

This is a rare affection of pregnancy, but is invariably rapidly fatal.

*Pathology.*—The nature and origin of the toxin is unknown.

The liver diminishes in size, due to fatty degeneration, the change beginning in the centre of the lobules, and rendering the tissue unrecognizable. The kidneys show acute nephritis.

*Symptoms.*—The onset is sudden with rigor and fever, persistent jaundice, vomiting of mucus, then bile, and lastly blood. Palpation over the liver causes pain, and percussion shows a daily diminution of the liver dulness. The urine is scanty, contains albumen and sometimes blood. The patient quickly becomes delirious, then comatose, and dies within six days. Abortion usually occurs, but this has no influence in delaying the progress of the disease.

*Treatment* is symptomatic, but is useless in averting a fatal ending.

## VII. Diseases of the Kidneys.

### 1. Chronic Nephritis.

Pregnancy has an injurious influence on cases of chronic nephritis, the progress of the disease being hastened. It frequently leads to abortion or premature labour by causing decidual endometritis and haemorrhages, with the formation of white placental infarcts. It may also cause premature separation of the placenta—placenta ablata or accidental haemorrhage.

The *treatment* should be carried out on general medical principles by rest in bed, milk diet and diuretics, in the endeavour to carry pregnancy to full time.

If all treatment fail, as indicated by an increase of dropsy, dyspnoea, the state of the pulse, and the results of examination of the urine, it may be necessary to induce abortion.

A woman with chronic nephritis should not become pregnant as even if she successfully passes through a pregnancy the disease is made more rapidly fatal by repeated pregnancies.

## 2. Pyelitis.

This shows itself in the latter half of pregnancy, and is usually unilateral, more often affecting the right kidney.

It is usually due to the bacterium coli spreading up from the bladder, more rarely does the infection reach the kidney by the blood or lymphatics.

The chief *symptoms* are fever, pyuria, and tenderness over the affected kidney.

*Prognosis*.—Many cases disappear after parturition, but in severe cases may persist. Severe cases may cause premature labour.

The *treatment* is rest in bed, milk diet, diuretics and urinary antiseptics, such as urotropin or helmitol, in gr. 15 doses every six hours.

It will rarely be necessary to induce abortion or premature labour except for very severe cases.

## VIII. Phthisis in Pregnancy.

Pregnancy, and especially the puerperium, hasten the progress of the disease, so that phthisical women should not marry, and if married, should not become pregnant. If she successfully pass through pregnancy she should on no account nurse, as lactation still further favours a rapid progress of the disease.

Well-marked phthisis does not justify induction of abortion, but it may be necessary to induce premature labour in the interests of the child if the mother is likely to die before the end of pregnancy.

## IX. Cardiac Disease in Pregnancy.

Mitral disease is a very serious complication of pregnancy, and in many cases is so aggravated that there is failure of compensation shown by dyspnoea, cyanosis, and oedema of the lungs. This leads to death of the foetus and abortion.

The greatest danger arises during labour, sudden death, with engorgement of the right side of the heart, occurring just after the child is born.

*Treatment*.—When failure of compensation threatens during pregnancy the patient should be kept at absolute rest in bed,



and strophanthus or digitalis given. If treatment fail it will be necessary, in the interests of the mother, to induce abortion, and this is all the more indicated if a previous pregnancy was passed through with difficulty.

During the second stage of labour the patient should be anaesthetized and delivered with forceps to prevent her bearing down.

The loss of several ounces of blood should be encouraged during the third stage or puerperium, and should there be signs of cardiac engorgement, open a vein in the arm,

**Rules as to Marriage.**—A woman with heart disease should not marry, but if she does, against medical advice, she should not become pregnant. Not a few women with cardiac disease may successfully pass through pregnancy and bear one or two healthy children, but the risk is great, as each pregnancy aggravates the disease and causes an earlier death than would otherwise have been the case had she never become pregnant.

## PART IV.

### THE PHYSIOLOGY OF LABOUR.

*Synonyms.*—Labour. Parturition. Confinement.

Labour may be normal—eutocia, or difficult—dystocia.

*Eutocia* (*eu*, well; *tokos*, childbirth) is labour with normal factors, and terminated by the natural forces.

The natural forces or *powers* are the uterine retractions and downbearing, which expel the *passengers*, the foetus and placenta with cord and membranes, through the normal parturient canal or *passages*, the lower uterine segment, cervix and vagina, all contained within the bony pelvis. The resistance to this expulsion depends on the size, position and presentation of the foetus, the dimensions of the bony pelvis, and the dilatability of the soft parts.

*Dystocia* (*dus*, difficult; *tokos*, childbirth) includes every form of abnormal or complicated labour as detailed under the “Pathology of Labour.”

#### I. Clinical Phenomena.

The Clinical Phenomena are :

1. The *premonitory symptoms and signs* which appear one to four weeks before the actual onset of true labour pains or labour proper.

2. *Labour proper* or true labour with three stages.

The period following the end of labour is the *puerperium* or lying-in period.

*Labour* is divided into *three stages* :

*First* stage, or stage of *dilatation*, during which the lower uterine segment and cervix are dilated.



*Second* stage, or stage of *expulsion*, during which the foetus is driven through the parturient canal and expelled.

*Third* stage, or *placental* stage, during which the placenta is separated from the uterus and expelled.

### 1. Premonitory Symptoms and Signs.

1. The *uterus sinks* and falls forward one to two weeks before the onset of labour, which causes a feeling of "sinking" or "lightening." The breathing is easier. There is an increased desire to urinate, due to pressure on the bladder; constipation is troublesome; there is difficulty in walking, and the venous obstruction in the pudenda and lower limbs is greater.

2. *Increased Vaginal Secretion*.—There is increased moisture, softening and relaxation of the vagina. When the discharge becomes blood-stained at the beginning of labour from separation of the membranes round the os internum, it is called "*The Show*."

3. *Cervix*.—In a *primipara* the cervix does *not* shorten nor open till labour begins, but in a *multipara* the canal may admit the finger as far as the *os internum* during the last three weeks or so of pregnancy. The finger may even pass through the os and feel the membranes and presenting part.

4. *False Pains*.—False pains may occur one, two, or even four weeks before labour. They are colicky pains felt in front due to *irregular uterine contractions*. Similar cramp-like pains may arise from the bowels or abdominal muscles. *Cause*.—Gastric disturbance; constipation; over-distended bladder; undue fatigue. *Diagnosis*.—The pains are irregular, may rapidly recur, and are felt in front of the abdomen. The hand feels the uterus contracting. The cervix does *not* dilate, and there is *no* protrusion nor formation of a bag of membranes. *Treatment*.—Treat the cause and prescribe rest, castor oil or a saline laxative. If there be much pain give opium. The false may pass into true labour pains, so visit the patient again, and advise her to send for you if they become severe and more regular like true labour pains.

### Labour Proper.

The *pain of labour* is due to two causes, viz. contractions of the uterus and dilatation and compression of the soft parts.

The *uterine contractions* cause *pain* in *front* of the abdomen,

due to compression of the nerves running between the muscular fibres and to stretching of the uterine ligaments. This pain is felt throughout the *whole of labour*.

The *dull aching* felt over the sacrum during the *first* stage is due to *stretching* of the *cervix*; the *bearing down* in the *second* stage to *stretching* of the *vagina*.

The severest pain of all, amounting to agony, is experienced just as the foetal head fully dilates and escapes from the vulva.

In rare cases labour may be painless, so that the mother is not aware it is in progress till she feels the foetal head low down in the vagina.

## 2. First Stage of Labour or Stage of Dilatation.

The first stage *begins* with the onset of true labour pains and *ends* with *complete canalization* of the *lower uterine segment* and *cervix*. It lasts from two hours to some days, the average being twelve to twenty-four hours in primiparae; six to eight hours in multiparae.

The phenomena are:

1. **Uterine, True or Labour Pains.**—These are regular cramp-like pains, due to *retraction of the uterine muscle*, the dull aching over the sacrum being caused by stretching of the cervix.

*Character of Pains.*—They are of a cutting nature, felt in the loins and sacral region, and pass round to the lower abdomen and even down the thighs. Each pain begins gradually, increases in intensity, then dies away, lasting in all sixty to ninety seconds. At first the pains recur every quarter to half an hour, then get more and more frequent till they occur every two or three minutes. Some women suffer little, others intensely, and they are restless, cry out and wish some one to press over the sacrum. There is as a rule no desire for food, and some suffer from a feeling of nausea, while others may vomit.

*Diagnosis.*—If the hand is placed over the abdomen during a pain the whole uterus is felt to harden and to erect itself, the fundus moving forward away from the spine. *Per vaginam* the finger notes that the cervix is being *dilated* and stretched by a *protruding* bag of membranes, which is *tense* as long as the pain lasts, and then *relaxes* when the contraction of the



uterus is finished, permitting the finger to feel the presenting foetal part above.

*Action of Pains or Retractions* (Figs. 36 and 37).—Fig. 36 shows the uterus at the end of pregnancy, with the cervix

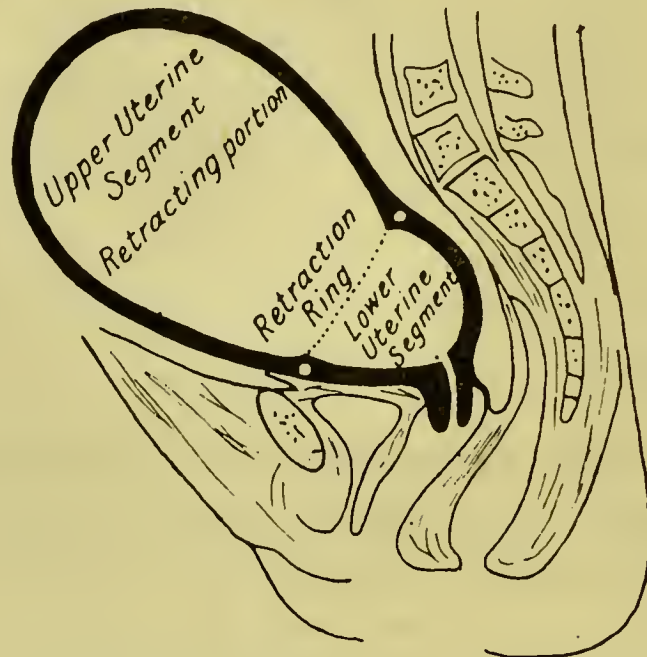


FIG. 36.—THE UTERUS AT THE END OF PREGNANCY, SHOWING THE UPPER AND LOWER UTERINE SEGMENTS. THE CERVIX IS CLOSED AND NOT SHORTENED.

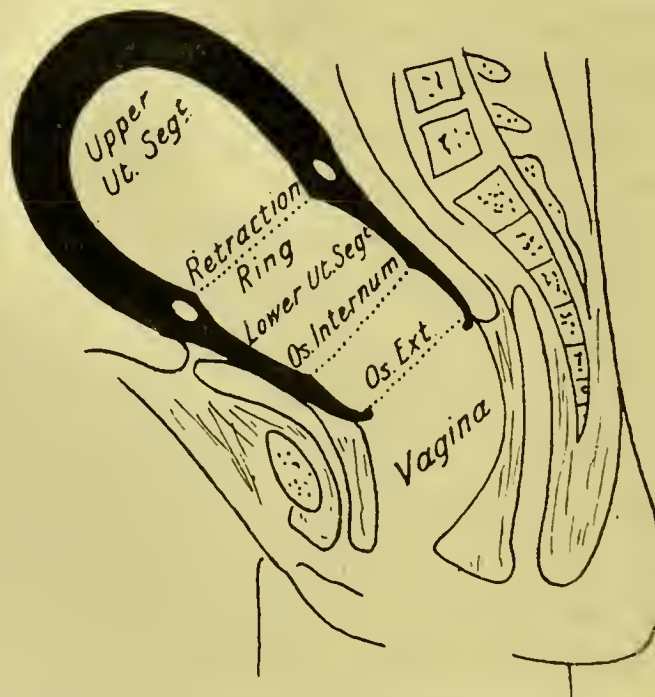


FIG. 37.—THE UTERUS AT THE END OF THE FIRST STAGE OF LABOUR, SHOWING FULL DILATATION OF THE LOWER UTERINE SEGMENT AND CERVIX.

closed and not shortened. *Note* the lower uterine segment and the position of Bandl's or retraction ring.

Fig. 37 shows the uterus at the end of the first stage of labour, with the lower uterine segment and cervix fully dilated, the cavity of the upper uterine segment reduced in size and

its wall thickened by retraction, while the retraction ring rises. The bladder is also pulled up.

During labour the *upper uterine segment* contracts and *retracts* and does expulsion. Repeated retractions cause progressive thickening of the uterine wall, the *retraction ring* rises, and the cavity of the upper segment is *reduced* in size. The *lower uterine segment* is *passive*, is pulled upon, *stretches* and thins, so its cavity is *increased* in area. Owing to the retractions, pressure is exerted on the uterine contents, driving them down, and thus dilating the lower uterine segment and cervix. The fundus uteri is prevented rising much ( $\frac{1}{2}$  to 2 ins.) by the uterine attachments, especially the round ligaments, which contract during a pain, draw the fundus forward and fix it in position. During the *second stage* the fundus uteri does *not* sink at all until the foetal head is just born. The uterus is thus elongated and narrowed. The foetus is also narrowed and elongated as a mass previous to expulsion.

*Effect of Pains or Retractions.*—1. The *placenta and placental area* diminish in size, but increase again as the pain passes off. The placental circulation is partly arrested.

2. The *membranes above* the retraction ring are thrown into folds but *not* separated; *below* the retraction ring they are *separated*, and thus form the *bag of membranes*.

3. *Mother.*—The pulse rate is increased to the acme of the pain, then slows again. The blood pressure is increased. Respiration slows, and is abolished while the woman is bearing down during the second stage. The temperature rises a fraction.

4. *Foetus.*—The heart rate is at first quickened, then slows, due to increased tension from compression of the villi. The foetus is elongated.

**2. Dilatation of Cervix** (Fig. 38).—The cervix dilates from *above* downwards till the os externum is felt as a thin ring, tense during a pain, relaxed between the pains. The edge is smooth and regular, but in multiparae more or less irregular from old tears. Dilatation is at first slow, but is more rapid after the os is the size of a crown piece.

*Cause.*—(a) The natural softening and relaxation of the tissues; (b) the wedge action of the bag of waters, and later of the foetal head; (c) the pains pulling the lower uterine segment and cervix upwards over the protruding ovum.



### 3. Formation of Bag of Membranes (dotted line U, Fig. 38).

—The pains strip the membranes off the lower uterine segment

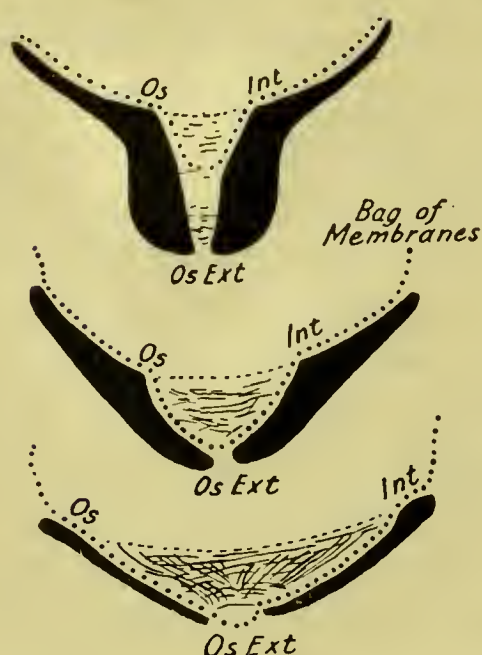


FIG. 38.—DIAGRAMS SHOWING THE METHOD OF DILATATION OF THE CERVIX FROM ABOVE DOWNWARDS BY THE BAG OF MEMBRANES.

owing to its passive stretching. The sac, driven down, is formed of amnion and chorion, filled with liquor amnii. Normally, it has a globular shape from the support given by the foetal head. It may be finger or sausage shape in malpresentations, deformed pelvis, etc., where it is not supported by the presenting part. The bag is tense during a pain, lax during the intervals, and acts as a *fluid wedge to dilate the cervix*.

### 4. Rupture of the Bag of Membranes.

—This usually occurs

at or near the stage of full dilatation of the cervix, when the liquor amnii contained in the sac escapes. This fluid, called the "*forewaters*," amounts to from one-half to one ounce. The foetal head being now well engaged fills the cervix, and thus prevents the escape of the liquor amnii in the uterus. In abnormal cases, such as malpresentations and deformed pelves, where the presenting part cannot adapt itself to the cervix to act like a ball valve, the whole liquor amnii in the uterus may escape at the time of rupture.

In some cases the membranes rupture prematurely, when the cervix is only partly dilated. This leads to delay, as the head is a less efficient wedge.

In a few cases the membranes may not rupture at the end of the first stage, and may remain intact till they are seen protruding at the vulva. More rarely the head is born completely enveloped in the membranes to form the *caul* or *lucky cap*. This is due either to the failure of the membranes to rupture, or they have ruptured higher up above the head, which becomes covered by the lower portion.

**5. Full Dilatation of Lower Uterine Segment and Cervix** (Fig. 37) to about 4 ins. in diameter ends the first stage. The os externum is not quite obliterated or taken up, but

remains as a small flaccid fold round the side of the dilated canal.

6. The **vagina** dilates more or less, although the presenting part is still high up and not expanding it (see Fig. 37).

7. **Vaginal Discharge.**—During the whole first stage there is more or less mucous discharge, which may be mixed with blood, due to separation of the membranes from the lower uterine segment and to small tears in the cervix.

Marked haemorrhage is pathological, for which see “Haemorrhage during Labour.”

### 3. Second Stage of Labour or Stage of Expulsion.

This stage *begins* with the *full dilatation* of the *cervix*, which now lets the head begin to descend, and *ends* with the *birth* of the *child*. It lasts from ten minutes, or even less, to six hours. Average, two hours primiparae, one hour multiparae.

The phenomena are :

1. **Pains.**—The pains of the uterine retractions, as felt in the first stage, are continued, but are more severe and more frequent. They are also of a bearing-down character, due to the pressure of the foetal head in the vagina. This stimulates the patient to use her accessory powers so as to reinforce the uterine action. When a uterine pain begins driving the foetal head down, the patient takes a deep inspiration, holds her breath by closing the glottis, and contracts her abdominal muscles and diaphragm. She bears down as long as the stimulus of the uterine contraction lasts, and in order to do this as effectively as possible she holds some article, such as a towel tied to the head of the bed, bends her knees, and presses with her feet against the foot of the bed. While bearing down the patient cannot cry out. At first bearing down is voluntary, and many patients abstain from this effective aid to the second stage and cry out, unless encouraged to help their labour. As the head descends lower, bearing down becomes semi-involuntary, and towards the end quite involuntary.

2. **Descent of Head.**—After the cervix is fully dilated, the head descends into the vagina. The head *advances* a little during the pains, and *recedes* a little after each. It advances more and more with each pain, and as descent goes on the occiput gets rotated to the front. A *sero-sanguineous swelling*, the *caput succedaneum*, forms in the scalp of the presenting part,



making it difficult to feel the sutures or fontanelles beneath. As the head descends, the pelvic floor is completely opened up, the pubic segment and bladder are pulled up (see Fig. 37), the sacral segment is driven down and back by the advancing head, and the perineum begins to bulge. Owing to pressure on the rectum by the head, the patient has a desire to defaecate, and if faeces are present in the bowel some is forced out of the anus with each advance of the head.

**3. Formation of Perineal Tumour and Expulsion of Child.**—As the head comes down to the vaginal outlet, the perineum

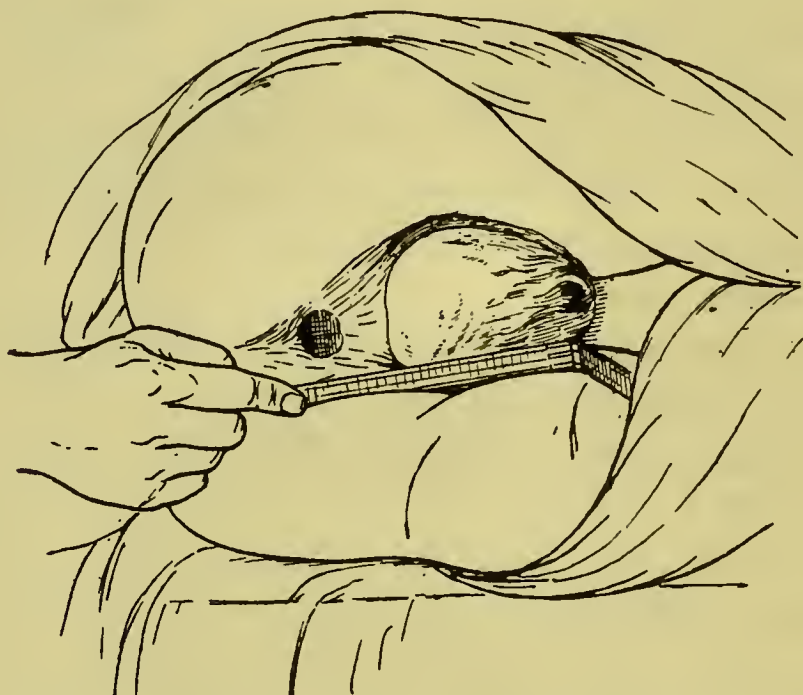


FIG. 39.—EXPULSION OF THE FOETAL HEAD, THE BROW COMING OVER THE PERINEUM.

(Note the Dilatation of the Anus.)

bulges more and more, getting correspondingly thinned as it stretches over the advancing head. The anus opens more and more, exposing its anterior wall and acquiring a "D" shape, with the straight limb looking forward. The occiput now comes out under the pubic arch and appears at the vulva, which opens (Fig. 39). The head can be seen to advance with each pain, and then slip back. When the occiput is fully protruded and the vulva distended to the maximum required to let the head pass, the patient bears down involuntarily with all her power and expels the head. Simultaneously with the escape of the head the perineum slips back over the face (Fig. 39). The act of final expulsion of the head is associated with intense pain, causing the patient to cry out in her agony.

The fundus uteri now sinks for the first time to follow the escaping foetus. After the head is born it slightly rotates to adapt itself to the shoulders, which are lying in the pelvic oblique diameter (so-called "*Restitution*"). Now comes a short pause, one to five minutes, during which the child's face gets cyanosed. Then the pains return, and the head further rotates ("*External Rotation*"), due to the internal rotation of the shoulders, so as to lie in the conjugate. The anterior shoulder passes under the pubic arch, then the posterior shoulder sweeps over perineum. Finally, the trunk and limbs are expelled, followed by a gush of the remaining liquor amnii contained in the uterine cavity. The *fundus uteri* follows the child, and sinks to *near level of umbilicus*.

#### 4. Third or Placental Stage.

This stage *begins* immediately after the child is born, and *ends* with the *expulsion* of the placenta and membranes and *lasting retraction* of the uterus. It lasts ten to thirty minutes or more.

The pains return after a short interval, and the placenta is gradually separated from below upwards. Separation is due to a disproportion between the placenta and placental site depending on the continued retraction of the uterus. After separation, further retractions expel it into the lower uterine segment and upper portion of the vagina, from which it is finally expelled by the action of the accessory powers, *i.e.* by the patient bearing down, provided it is not manually expressed by the obstetrician.

During separation the uterus can be felt contracting and elevating itself, and there is generally some haemorrhage; from ten to fourteen ounces in normal cases.

*How can you tell when the placenta has been separated?*—When the placenta has been driven into the lower uterine segment and vagina the following points may be noted. The *upper uterine segment* is *smaller*, not so thick antero-posteriorly, and is higher up; the *lower uterine segment* is more *distended*, forming a *swelling* just above the *symphysis pubis*; more of the *cord protrudes* from the vulva, and this is easily seen if the second ligature used to tie the cord is placed close to the vulva.



There are two methods by which the placenta is separated and expelled :

1. Duncan's mechanism (Fig. 40). The placenta is separated from below upwards and expelled *edgeways*, followed by the membranes.

2. Schultze's mechanism (Fig. 41). A retro-placental blood-clot forms which separates the placenta about its centre. The



FIG. 40.

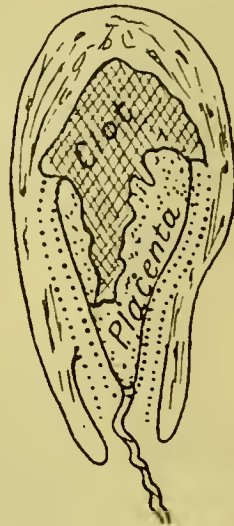


FIG. 41.

#### METHODS OF SEPARATION AND EXPULSION OF THE PLACENTA.

FIG. 40.—DUNCAN'S MECHANISM, EDGEWAYS.

FIG. 41.—SCHULTZE'S MECHANISM. SEPARATION BY MEANS OF A RETRO-PLACENTAL BLOOD-CLOT AND EXPULSION, FOETAL SURFACE FIRST.

clot enlarges and further separates the placenta at each contraction, the clot acting as a wedge. The placenta is expelled, foetal surface first, followed by the membranes. When these are turned back a large blood-clot is found on the maternal surface.

In the author's experience Duncan's mechanism is the commoner, especially if the hand controls the uterus during the whole third stage.

After the placenta is born, the uterus *retracts* firmly and is felt like a *hard ball* sunk well into the pelvis, the fundus being *below* the level of the umbilicus and about  $3\frac{1}{2}$  or 4 inches above the symphysis pubis.

A few hours later the uterus gets softer and larger, the fundus rising to about the level of the umbilicus.

*Duration and Time of Labour.*—The average duration of labour in primiparae is seventeen to eighteen hours ; in multiparae nine to ten hours.

About as many labours end during the day as during the night, so that the former view held that most labours are nocturnal is erroneous.

*Cause of Onset of Labour.*—Various theories have been advanced to account for the onset of labour at the end of pregnancy, but none of them are sufficiently explanatory.

## II. Factors of Labour.

The three factors concerned in labour are :

1. The powers, essential and accessory.
2. The passages, bony and elastic.
3. The passengers, foetus and placenta, with cord and membranes.

### 1. The Powers.

The *essential power* is the uterus. It is felt contracting during a pain, each contraction lasting from sixty to ninety seconds (see also under "Clinical Phenomena," p. 113). The action is quite involuntary and goes on during narcosis, coma, or even after maternal death. Mental emotion may, however, suspend it for a time, which is not infrequently seen by the doctor when he is called to a case.

Experiments show that uterine contractions depend little on the central nervous system, and labour may progress normally in paraplegia due to compression of the cord, in myelitis and in locomotor ataxia.

The *stimulus to uterine contractions* probably comes from the cervical ganglion, which lies above the posterior aspect of the vaginal vault. The ganglion is composed of sympathetic elements from the first to third sacral ganglia, and fibres from the second to fourth sacral nerves, with connecting fibres to the hypogastric plexus. The majority of the uterine nerves come from the cervical ganglion, a minority coming from the hypogastric plexus, which lies on each side of the rectum.

A uterine contraction is of the nature of a rapid peristalsis from the fundus downwards, and only affects the upper uterine segment. It begins gradually, increases in intensity to its acme, then dies away. As relaxation is not complete, the muscle fibres becoming progressively shorter and thicker after each contraction, this action of the uterus is called a



*retraction.* The wall of the upper segment thus becomes progressively thicker, and the cavity more and more diminished after each pain (see Fig. 37). On the other hand, the lower uterine segment is passive, its wall becomes stretched and thin, and the cavity elongated and canalized.

The foetus and liquor amnii form together one mass, acting mechanically like fluid which transmits the uterine force in all directions at right angles (Fig. 42). This compression sets up a condition of pressure—“*general contents pressure*”—which acts

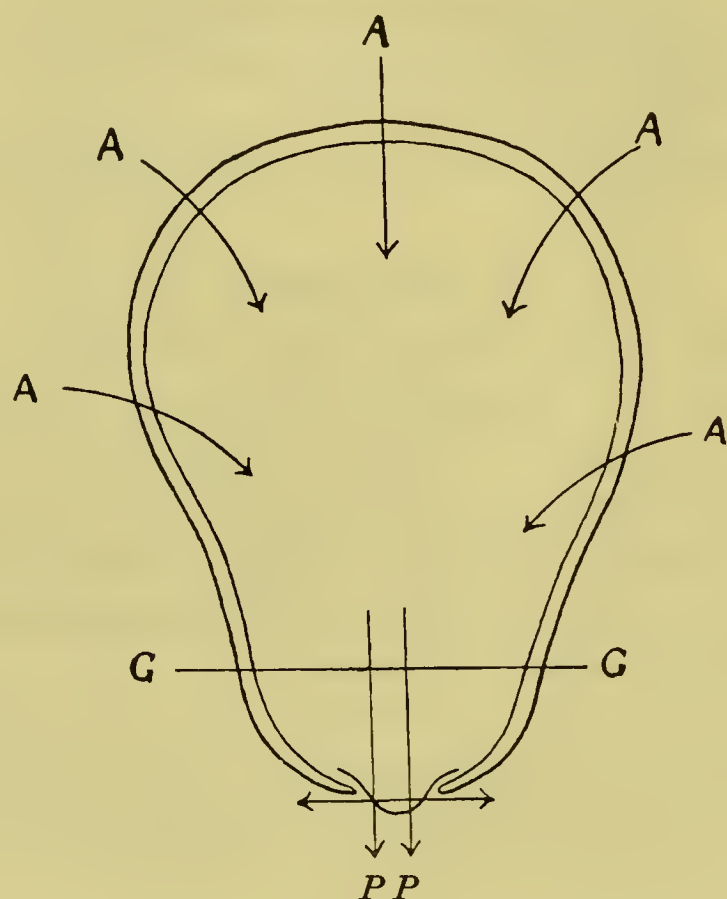


FIG. 42.—DIAGRAM SHOWING THE ACTION OF THE UTERINE RETRACTIONS AND ACCESSORY FORCES.

at right angles to the *plane of the girdle of resistance* (Fig. 42 PP). The *girdle of resistance* is the part (Fig. 42 GG) where the foetal head is gripped by the tissues.

*Bipolarity of Uterus—Law of Polarity.*—This is the relationship between the upper uterine segment and the cervix, where the cervix relaxes when the upper uterine segment contracts. The lower uterine segment also relaxes. If the cervix is forcibly dilated the uterus contracts.

The *accessory powers* are the abdominal muscles, diaphragm and other muscles required to increase intra-abdominal pressure, just as in the act of defaecation, and are brought into action

during the second stage and expulsive part of the third stage. They reinforce the uterine action, acting like fluid pressure at right angles to the rigid uterine wall (Fig. 42 AA), and thus aid the expulsion of the uterine contents. They also aid in fixing the fundus and keeping the uterus in the proper axis to correspond with that of the pelvis.

*First Stage.*—The uterus (upper segment) alone acts.

*Second Stage.*—The uterus and accessory powers both act.

*Third Stage.*—The uterus separates the placenta and expels it into the lower uterine segment and vagina, when the accessory powers expel it.

## 2. The Passages.

The *passages* concerned in the three stages of labour have already been described and are:

*First stage*, the lower uterine segment and cervix ;

*Second stage*, the bony pelvis, vaginal aspects of the pelvic floor segments, perineum and vulva ;

*Third stage*, as in the first and second stages.

The pubic segment is pulled up during labour, while the sacral segment which lines the posterior part of the pelvis is driven downwards and backwards by the advancing foetus. The sacral segment, being elastic, resists and recoils upwards and forwards, thus exercising an important influence on head moulding and on the various head movements.

## 3. The Passengers.

The *passengers* in the three stages of labour are :

*First stage*, the bag of membranes ; *second stage*, the foetus ; *third stage*, the placenta, cord and membranes.

These have been already described.

## III. Cranial, Vertex or Head Presentation.

*Engagement* is the mechanism by which the presenting part enters the brim of the pelvis. The head engages in about the occipito-frontal plane.

*Presentation.*—In 96 per cent. of all cases the vertex presents, the long axis of the foetal ovoid being parallel with that of the uterus. The occipito-frontal diameter is, however, not quite



parallel with the plane of the brim, and the centre of the vertex is not usually in the axis of the inlet. There may be normally, at the *onset* of labour, three varieties of vertex presentation :

(a) The anterior parietal presents = anterior asynclitism (22·5 per cent.), the sagittal suture lies posterior to the pelvic axis.

(b) The posterior parietal presents = posterior asynclitism (53·75 per cent.), the sagittal suture lies anterior to the pelvic axis.

(c) Vertex or synclitic (23·75 per cent.), the centre of the vertex lies in the pelvic axis (De Seigneux's percentages in eighty cases).

As labour advances the presentation becomes *synclitic*.

In *primiparae* the head descends into the brim (*i.e.* engages) some weeks before the onset of labour, the presenting plane being more *suboccipito-frontal*, *i.e.* the occiput is lower (see Fig. 57).



FIG. 43.—VERTEX PRESENTATION.  
FIRST POSITION, L.O.A.

In *multiparae* the head is at or a little above the brim level at the onset of labour, the presenting plane being more *occipito-frontal* (see Fig. 58).

*Positions.*—Position is the relation of the presenting part to the mother's pelvis, which in vertex presentation is the occiput. The antero-posterior diameter of the head lies more or less in one of the oblique diameters of the pelvis; most commonly in the right oblique with the occiput left

anterior (Fig. 43). This is due to the obliques being roomier than the available transverse. There are *four positions* named according to the position of the occiput with reference to the brim of the mother's pelvis.

*First vertex*, left occipito-anterior, or L.O.A., first in frequency. The long diameter of the head—occipito-frontal—lies in the right oblique with the occiput to the left anterior (Figs. 43 and 44).

*Second vertex*, right occipito-anterior, or R.O.A., third in

frequency. The long diameter of the head lies in the left oblique with the occiput to the right anterior (Fig. 45).

*Third vertex*, right occipito-posterior, or R.O.P., second in frequency. The long diameter of the head lies in the right oblique with the occiput to the right posterior (Fig. 46).

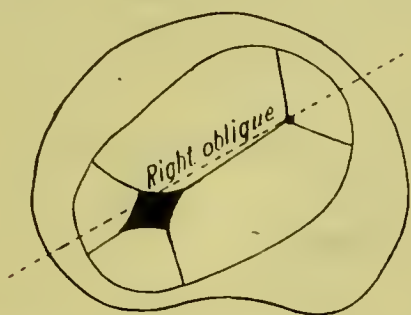


FIG. 44.—FIRST POSITION, L.O.A.

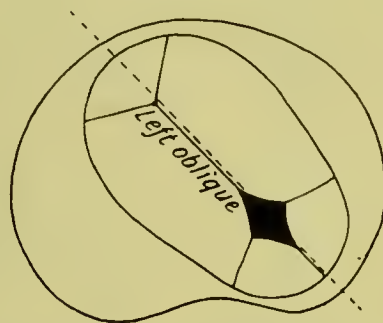


FIG. 45.—SECOND POSITION, R.O.A.

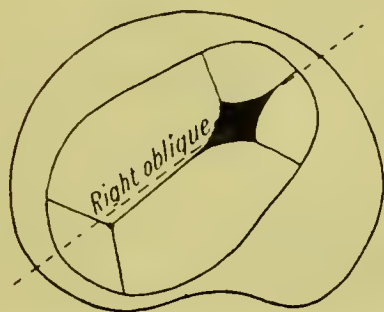


FIG. 46.—THIRD POSITION, R.O.P.

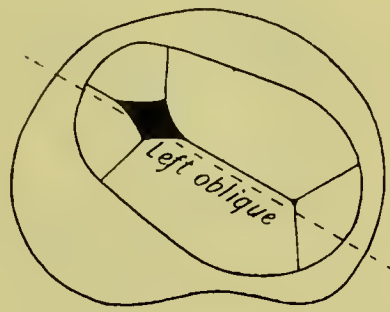


FIG. 47.—FOURTH POSITION, L.O.P.

Diagrams of the Four Vertex Positions as examined *per vaginam*, the patient lying on her back. The head is shown slightly extended for the sake of clearness.

*Fourth vertex*, left occipito-posterior, or L.O.P., fourth in frequency. The long diameter of the head lies in the left oblique with the occiput to the left posterior (Fig. 47).

### 1. Mechanism of Labour in Vertex Presentations (Fig. 48).

There are *four* movements during which *descent* is always going on.

**1. Flexion** (Fig. 48<sup>2</sup>).—At the beginning of labour the head is already flexed with the chin on the chest—the normal attitude—therefore so-called flexion is mainly a movement of the head relatively to the mother's pelvis. It is the apparent descent of the occiput, the posterior fontanelle coming more into reach of the examining finger in the vagina, while the anterior fontanelle passes out of reach. The occiput thus presents instead of the vertex.

*Place*.—It occurs where the head first meets with resistance. As the degree of flexion depends on the amount of resistance,



it is usually noticed as the head passes the brim, but it may not be marked till further down.

*Cause.*—It is due to the elastic recoil of the maternal soft parts surrounding the head, viz. the dilating lower uterine segment and cervix.

*Result.*—It substitutes the smaller suboccipito-bregmatic diameter and the smaller and more rounded S.O.B. periphery

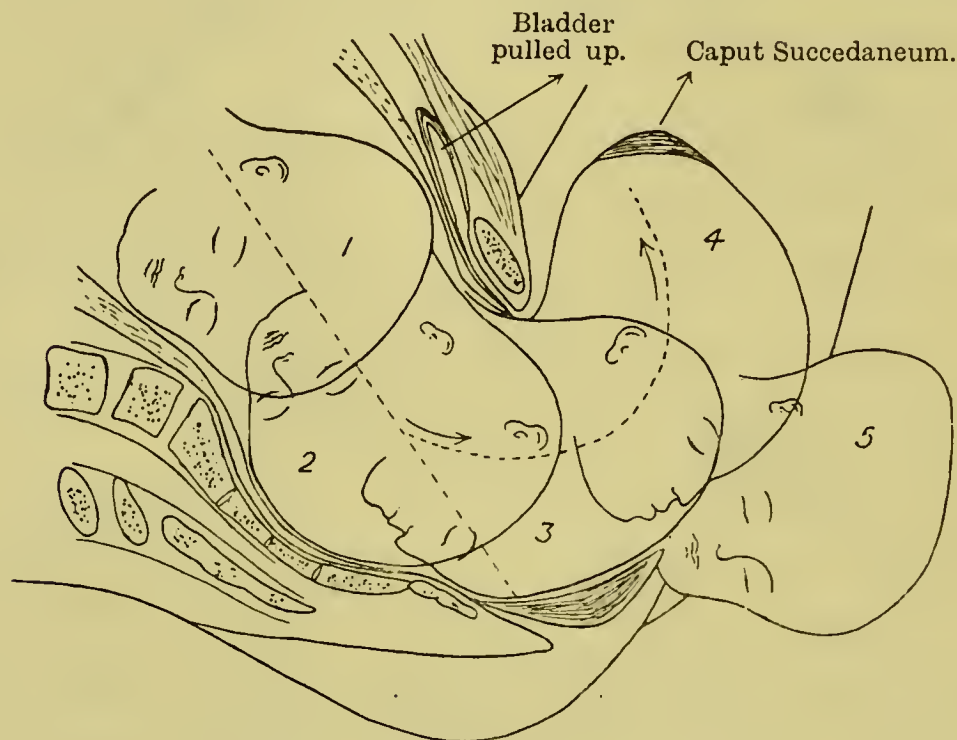


FIG. 48.—MECHANISM OF LABOUR IN L.O.A.

1. Head at Onset of Labour.
2. Flexion; the Occiput descends.
3. Internal Rotation into the Conjugate, Occiput to the front.
4. Extension and Birth of Head; the Forehead comes over the Perineum.
5. Restitution and External Rotation.

for the larger occipito-frontal periphery. The head thus passes into the cavity of the pelvis, where internal rotation occurs.

**2. Internal Rotation** (Fig. 48<sup>3</sup>).—The head turns on a vertical axis, so that the occiput passes forward to lie under the pubic arch.

*Place.*—It occurs in the pelvic cavity where the occiput becomes pressed on by the sacral segment.

*Cause.*—It is due to the elastic recoil of the sacral segment. Hart's law is: "That part of the foetus (occiput, chin, breech, etc.) first persistently striking a lateral half of the sacral segment becomes rotated to the front."

*Result.*—It brings the long antero-posterior diameter of the head into the long conjugate of the outlet (Fig. 49), so that the head can now be born by extension.

3. **Extension** (Figs. 48<sup>4</sup> and 49).—This is the apparent more rapid descent of the sinciput. The head, as a whole, really passes through the vulva, and the chin does not leave the sternum till the head is just born (Fig. 49).

*Place.*—It occurs as the head is escaping from the vulva. The occiput comes out under the pubic arch till the nape of the neck is against the pubic arch. Then the sinciput comes over the perineum, which now *slips back* over the face (see Fig. 39). When the suboccipito-bregmatic periphery has passed the vulva the greatest circumference is born, so that the rest quickly follows, and the chin leaves the sternum (true extension).

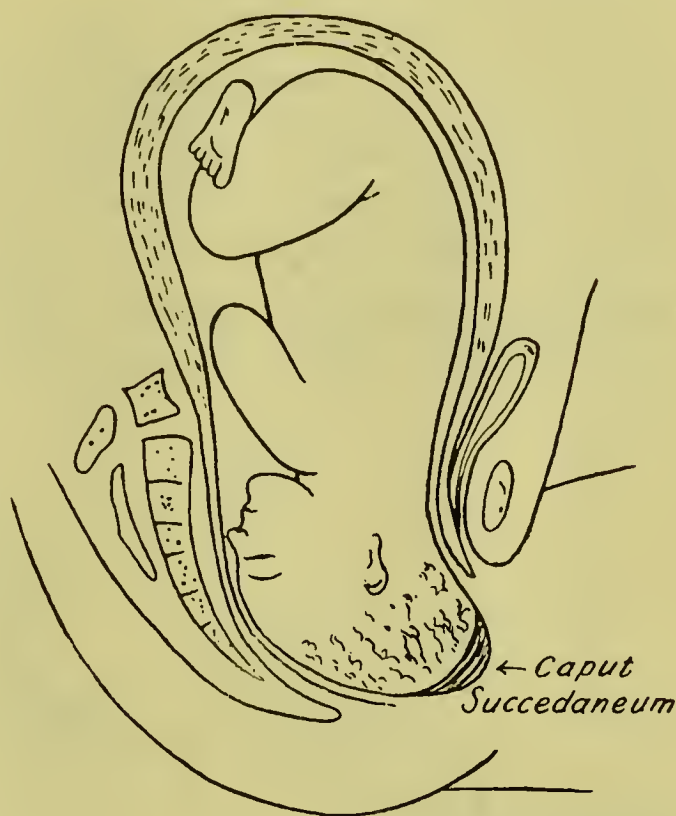


FIG. 49.—A VERTEX CASE NORMALLY ROTATED WITH THE OCCIPUT TO THE FRONT.

*Cause.*—It is the resultant of two forces acting in different directions, viz. the uterus downwards and backwards; the recoil of the sacral segment forwards and upwards.

*Result.*—Escape or birth of the head.

4. **Restitution and External Rotation** (Fig. 48<sup>5</sup>).—The head escapes from the vulva in the conjugate, while the bisacromial diameter of the shoulders lies in the oblique diameter of the pelvis. There is slight torsion of the neck from this, so when the head is born it turns slightly (to left in L.O.A.) to bring it into normal relation at right angles with the bisacromial diameter of the shoulders. This is *Restitution*. When the shoulders rotate into the conjugate the head rotates simultaneously in the same direction (to left in L.O.A.). This is *external rotation*.

*Cause.*—The nearer or deeper shoulder first striking the lateral half of the sacral segment is rotated to the front.

*Result.*—It allows the long transverse of the trunk to escape in the long conjugate of the outlet. The anterior shoulder



passes under the pubic arch, then the posterior shoulder sweeps over the perineum, and the trunk is quickly born, followed by the lower limbs.

### Occipito-Posterior Positions.

In *occipito-posterior* positions the same mechanism occurs as in *occipito-anterior* positions, but the occiput has to make a longer rotation to the front. Sometimes, however, a malrotation takes place, the occiput making a short rotation backwards into the hollow of the sacrum.

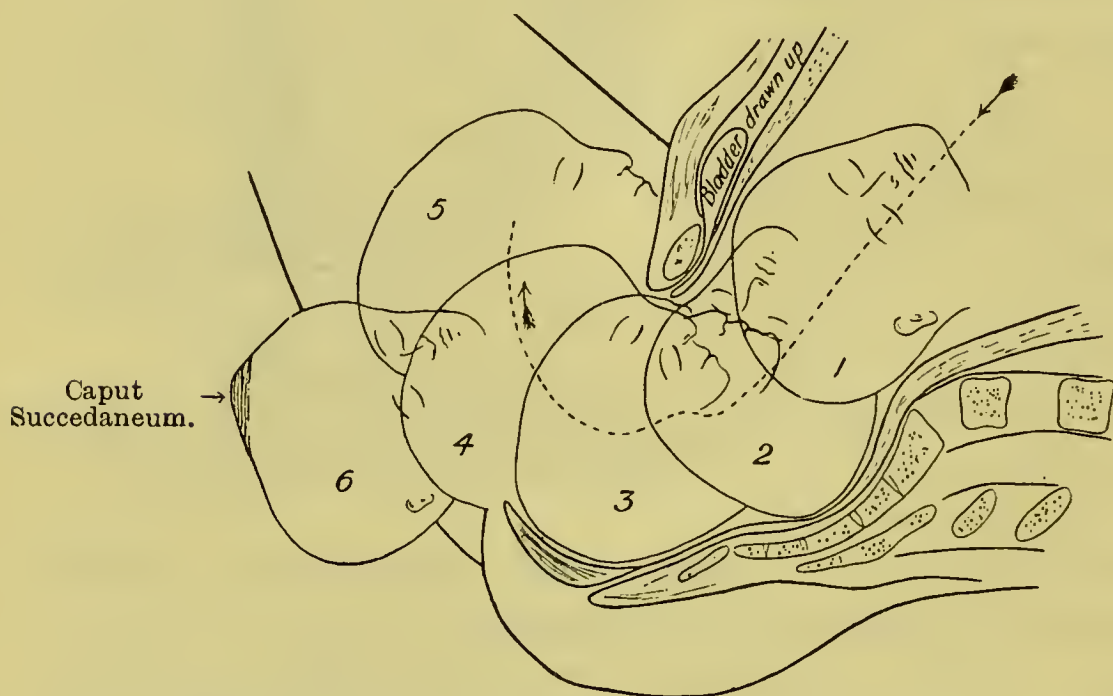


FIG. 50.—MECHANISM OF LABOUR IN THE UNFAVOURABLE FORM OF MALROTATED R.O.P.

1. Head at Onset of Labour.
2. Slight Extension.
3. Internal Rotation with the Sinciput to the front.
- 4 and 5. Birth of the Head by Flexion and Extension. The Occiput comes over the Perineum.
6. Restitution and External Rotation.

### 2. Mechanism in Malrotated Occipito-posterior Cases.

Also called “persistent occipito-posterior” or “face to pubes” cases (Figs. 50 and 51). There are *two* mechanisms, (a) *favourable* (commoner method), (b) *unfavourable* (rarer method).

#### (a) Favourable.

1. **Flexion.**—As usual.
2. **Internal Rotation.**—*Cause.*—It is due to a small head or a roomy pelvis or a lax sacral segment in a multipara. The

head having too much play, or the lax tissues not being able to push the occiput forward, the occiput passes backwards into the hollow of the sacrum.

**3. Flexion.**—The anterior region of the bregma impinges under the pubic arch; the occiput sweeps over the perineum; then by *extension* the brow comes out under the pubic arch, followed by the face and chin, and the head is born.

**4. Restitution and external rotation** to right or left. This is the *favourable* method, because the head escapes through the vulva in the *suboccipito-bregmatic periphery*.

(b) **Unfavourable.**

The head, whether large or small, enters the pelvis slightly *extended*. This is said to be favoured by the child's spinal column being extended by the opposition of the maternal lumbar vertebrae, *i.e.* extension of the child's spine extends the head.

**1. Extension.**—The sinciput is lower.

**2. Internal Rotation.**—The sinciput leading, and thus first striking the lateral half of the sacral segment, makes a *short* rotation to front, the occiput thus passes into the hollow of the sacrum. The head reaches the outlet slightly extended (Fig. 50<sup>3</sup>).

**3. Flexion.**—The brow at a point anterior to the bregma impinges under the pubic arch (Figs. 50<sup>4</sup> and 51); the occiput sweeps over perineum; and lastly, by *extension*, the face comes out under the pubic arch, and the head is born.

**4. Restitution and external rotation** to right or left (Fig. 50<sup>6</sup>).—This is the *unfavourable* method, as the head is born in the larger *occipito-frontal diameter* (periphery), and as the vulva is over-stretched the perineum is readily torn.



FIG. 51.—MALROTATED VERTEX CASE OR PERSISTENT OCCIPITO-POSTERIOR.

The Head is born by Flexion; then by Extension the Face comes out under the Pubic Arch.



#### IV. Foetal Head Moulding.

During labour the plastic bones let the head mould. The acquired shape, along with the caput succedaneum, is characteristic of the different head presentations (see Figs. 53 and 54, also under "Brow and Face Presentations"). The slower the labour and the longer the pressure, so much the greater is the head moulding, and the larger the caput succedaneum. Usually a caput succedaneum does not form when the head is at the cervix *so long as the bag of waters is intact*.

##### 1. Caput Succedaneum.

This is the sero-sanguineous swelling which forms on that part of the scalp presenting over the canalized portion of the

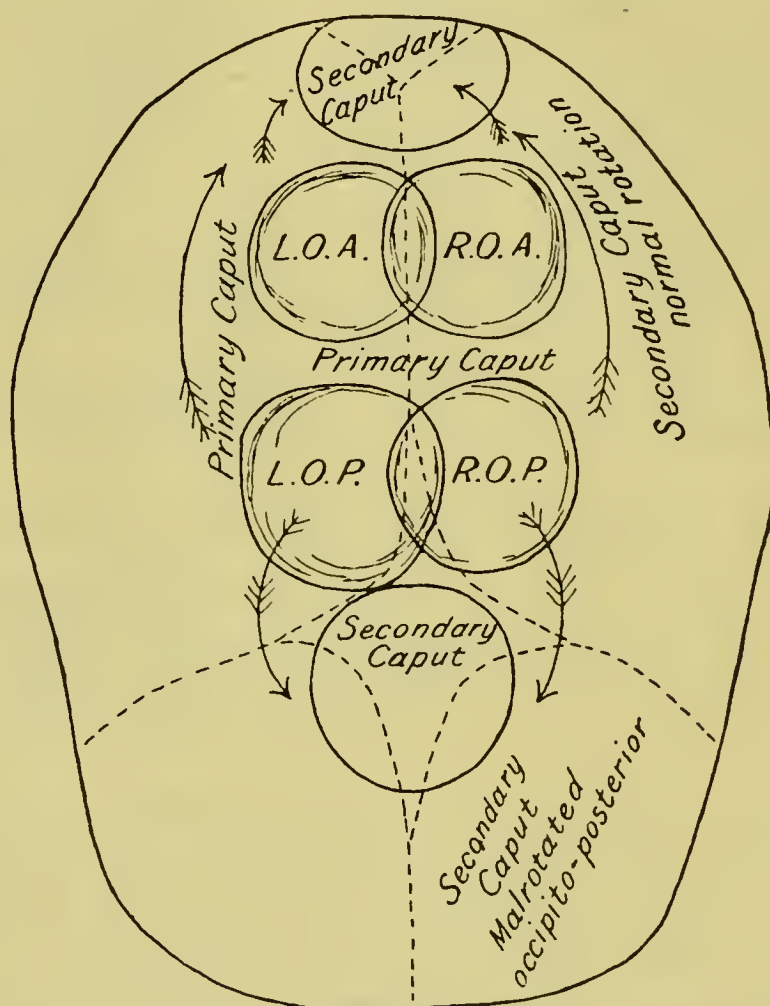


FIG. 52.—DIAGRAM SHOWING THE PRIMARY AND SECONDARY CAPUT SUCCEDANEUM IN THE FOUR VERTEX POSITIONS.

genital tract. It has a bruised, bluish look and a soft, dough-like feel. It is due to transudation of serum, often with small blood extravasations, depending on venous stasis from pressure

by the maternal soft parts surrounding the presenting portion of the foetal head.

The size depends on (a) the rigidity of the maternal tissues, (b) the severity of the pains, (c) the length of the labour, and (d) the condition of the foetal presenting part, *e.g.* the large swelling on the face in face presentation. The *primary* caput succedaneum is formed on the vertex when the head is high up at the cervix, after rupture of the membranes, and occurs on that portion of the scalp lying more anteriorly in the pelvis, *e.g.* over the posterior superior part of right parietal in L.O.A. (Fig. 52). As the head descends and rotates, and the site of presenting part thus changes, the position of the caput succedaneum changes as

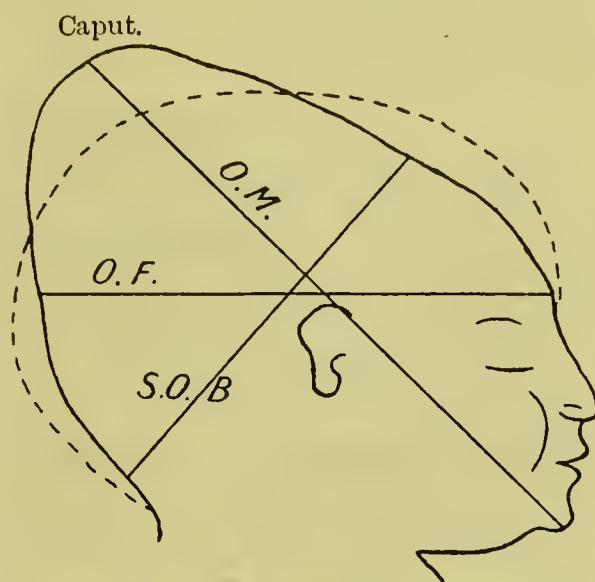


FIG. 53.—HEAD CONFIGURATION AFTER DELIVERY IN NORMALLY ROTATED VERTEX CASES.

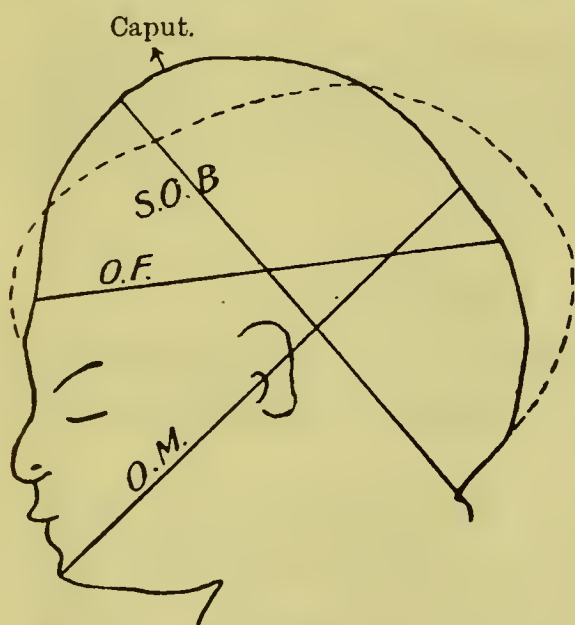


FIG. 54.—HEAD CONFIGURATION AFTER DELIVERY IN MALROTATED OCCIPITO-POSTERIOR CASES.

well. The *secondary* caput succedaneum is formed on the part presenting at the outlet. If labour be long delayed at the outlet the secondary caput succedaneum is well marked (Fig. 53), while the primary caput succedaneum largely disappears. The swelling disappears in thirty or forty hours. It is an absolute sign of what part of the child was born first, as it only forms on the presenting part, be it vertex, face or breech. Hence it is important medico-legally, *e.g.* a child is found dead and an alleged breech case is stated as the cause of death, yet the "caput" is seen on the head, proving conclusively that it was born head first.



## 2. Shearing.

The occipital and frontal bones pass under the parietals. One parietal passes under the other, more frequently the posterior under the anterior.

## 3. Compression of the Head.

Head compression by the maternal soft parts in a normal pelvis causes a characteristic head moulding, which, however, disappears in about a week. This compression and alteration in shape is favoured by the shearing of the bones. In normally rotated vertex cases the shape is as in Fig. 53. The suboccipito-bregmatic and occipito-frontal diameters are shortened; the occipito-mental is elongated. In malrotated occipito-posterior cases the shape is as in Fig. 54. The suboccipito-bregmatic diameter is lengthened, the others are shortened. Brow and face cases have also special characteristic shapes (see under).

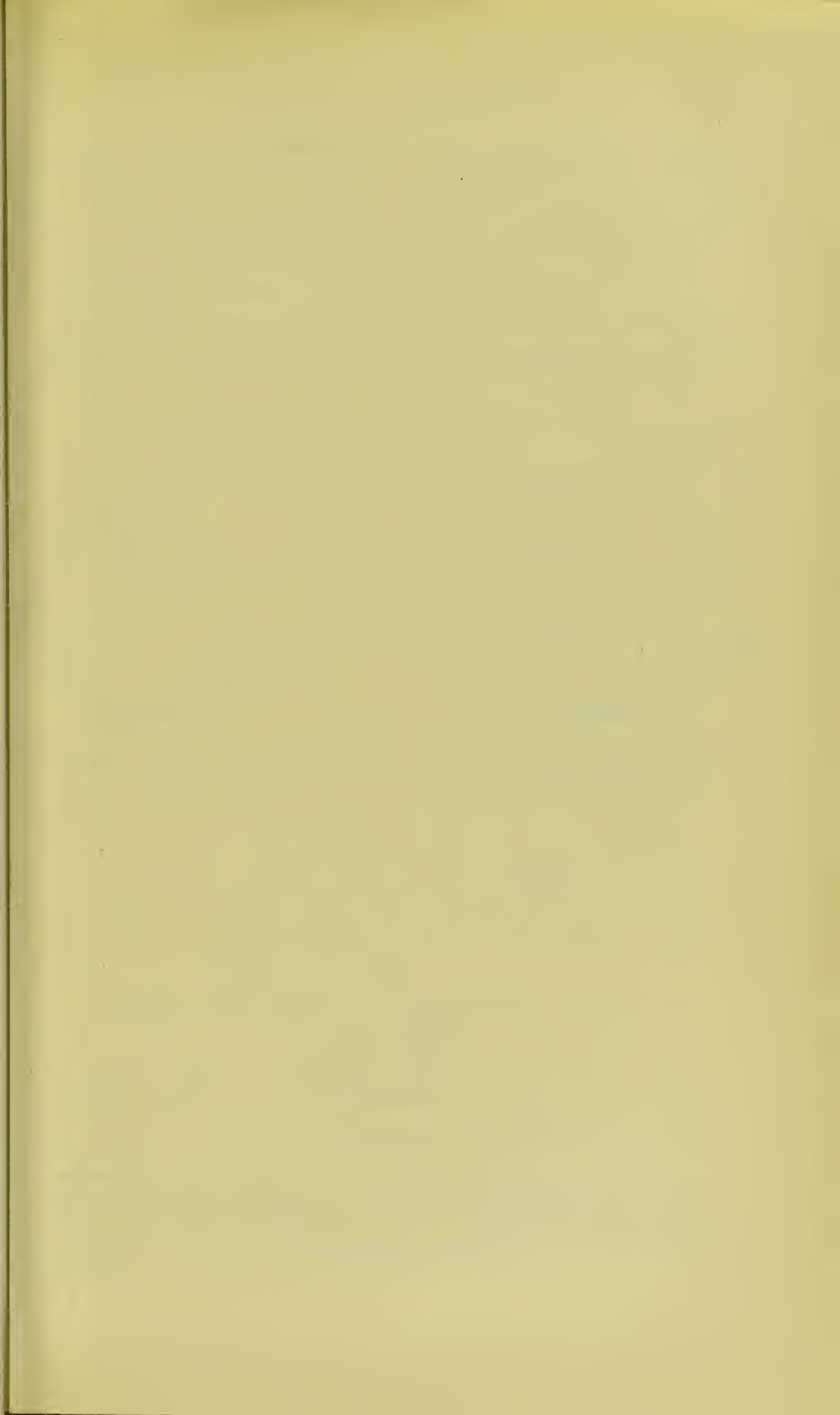
# V. Methods of Examination for Diagnosing Position and Presentation of Foetus, etc.

These are (1) abdominal palpation (Figs. 55 to 59), (2) auscultation, (3) vaginal examination, (4) bimanual examination. The patient should lie on a hard bed, with the abdomen fully exposed. The bladder must be empty.

## 1. Abdominal Palpation.

This is more difficult in primiparae than in multiparae, and its accuracy is impaired by thick abdominal walls, hydramnion, or a uterus deformed by fibroids.

**First Manœuvre** (Fig. 55).—Face the patient's head, and with the fingers close together lay the hands obliquely on the abdomen and quite flat. Do not dig in the fingers. Ascertain the outlines of the uterus, and note if the foetus is in the longitudinal or transverse lie. Move the hands towards the fundus, which is then defined by the finger tips. If it is a longitudinal lie, note whether the breech or the head occupies the fundus uteri. The breech has the feel of a large, movable, irregularly shaped, nodular body softer than a head. The head feels hard, round and larger than a breech. Movement of the breech





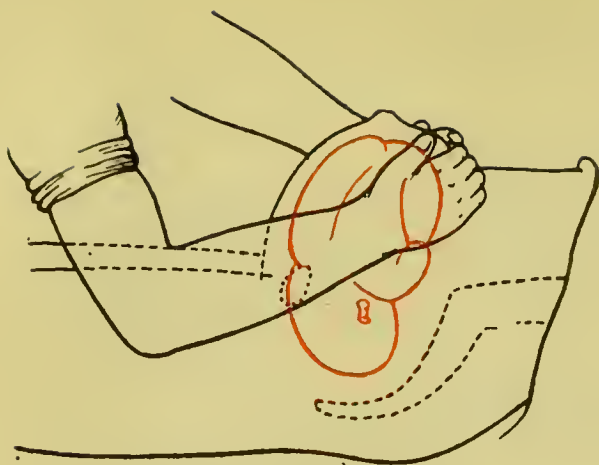


FIG. 55.—FIRST MANŒUVRE OR GRIP.

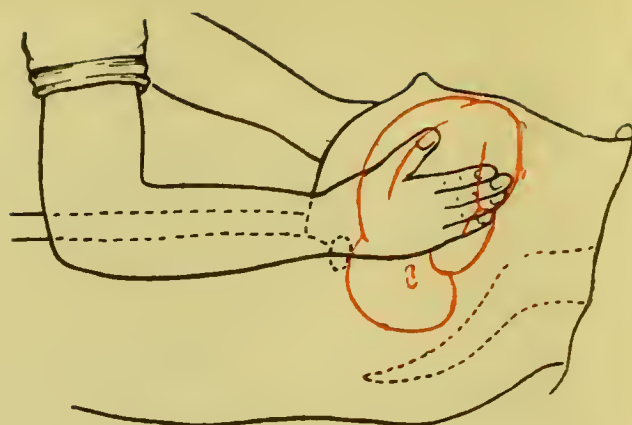


FIG. 56.—SECOND MANŒUVRE OR GRIP.



FIG. 57.—THIRD MANŒUVRE OR PAWLIK GRIP ON A PRIMIPARA.



FIG. 58.—THIRD MANŒUVRE OR PAWLIK GRIP ON A MULTIPARA.

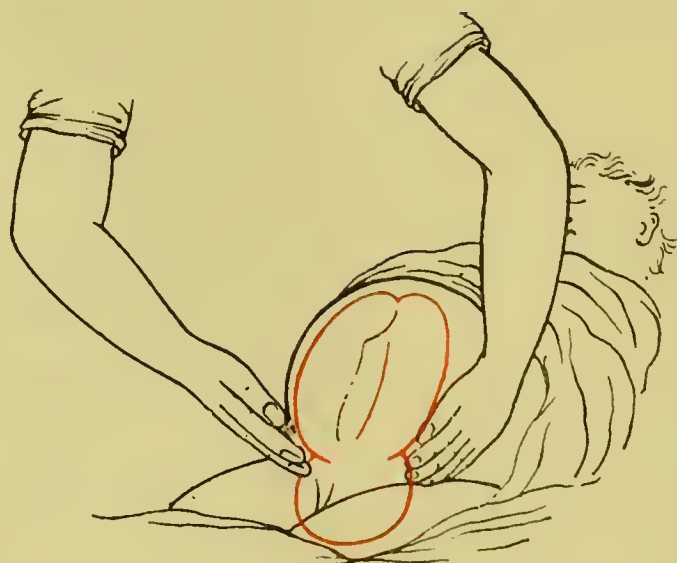


FIG. 59.—FOURTH MANŒUVRE OR GRIP.

FIGS. 55-59.—METHOD OF PALPATING THE UTERUS AT THE END OF PREGNANCY OR DURING THE FIRST STAGE OF LABOUR TO DIAGNOSE THE LIE, POSITION, AND PRESENTATION OF THE FOETUS.

For details regarding each Manœuvre, see the text.

To face p. 133.

equally affects the trunk, but the head can be slightly moved independently of the trunk.

**Second Manœuvre** (Fig. 56).—Slide both hands downwards to the sides of the uterus. One hand feels the foetal limbs or small parts as small nodules, the other hand feels the back as a hard, resistant surface. The appreciation of the foetal parts is aided by pressing one hand on the middle of the uterus to force away the liquor amnii, while the other hand palpates. By noting whether the back is directed to the left or right, anteriorly or posteriorly, the foetal position is determined.

**Third Manœuvre** (Figs. 57 and 58), **Pawlik Grip**.—Grasp the uterus between the thumb and fingers of the right hand just above the symphysis pubis, and note whether the head or breech present. In primiparae the head at the end of pregnancy lies deeper than in multiparae, so press the fingers more deeply towards the cavity of the pelvis (Fig. 57). In multiparae, as the head stands higher (Fig. 58), press directly backwards. If neither breech nor head is felt, look for transverse presentation. If the presenting part be engaged in the pelvis pass on to the

**Fourth Manœuvre** (Fig. 59).—Now face the patient's feet. The patient flexes and slightly abducts her thighs. Press slowly and firmly deep into the pelvis with the finger tips. In vertex presentation one hand is arrested sooner by the more projecting forehead, while the other hand sinks deeper on the side towards which the back lies. In face presentation, the head being extended, the prominence (occiput) is on the same side as the back. The extent of descent of the head into the pelvis may be estimated according to the degree of ease with which the prominence is felt.

#### **Palpating Round Ligaments and Diagnosing Position of Placenta.**

During uterine contractions, palpate in the region of the internal abdominal ring, when the round ligaments may be felt as rounded cords. The intensity of their contraction gives some idea of the manner in which the uterus is acting. If they are traced upwards and found converging towards the fundus uteri, the placenta is usually situated posteriorly. If they are parallel or divergent, the placenta lies anteriorly (see p. 24).



### Palpation of Uterus during Labour Pains.

The retracting upper segment of the uterus is felt firm and hard during a pain, whereas the passive lower uterine segment feels elastic and almost fluctuant. If there be obstruction to labour, preventing descent of the foetal head, and the lower uterine segment is becoming overstretched, the retraction ring may be felt as a transverse ridge across the lower abdomen (see under diagnosis, "Threatened Rupture of Uterus," p. 251).

### 2. Auscultation.

The foetal heart is heard loudest about the region of the lower angle of the foetal scapula. In face cases it is best heard over the foetal thorax. In vertex presentation it is heard loudest to right or left below the umbilicus on the same side as the foetal back lies (see under "Diagnosis of Pregnancy," p. 52.)

### 3. Vaginal Examination.

Mistakes are frequently made by trusting to vaginal examination alone, so it should only follow a thorough abdominal examination. It should also be limited as much as possible, owing to the risk of introducing sepsis. In normal labour one, or at most two, vaginal examinations suffice.

**Disinfect Hands and Vulva.**—You must thoroughly disinfect the hands, and, still better, wear rubber gloves. Thoroughly cleanse the vulva with wadding, wet with an antiseptic such as one-half per cent. lysol. Wipe backwards, using a fresh swab for each wipe. On no account swab upwards, as germs may be carried into the vulva from the anal region (see p. 140).

**Method of Introducing Fingers into Vagina.**—Open the labia with the fingers of one hand, and introduce two fingers of the other hand directly into the vagina under the guidance of sight. This can be done with little exposure of the patient if she lie on her left side, as the bed clothes only require to be raised over the nates.

**Diagnosis of Presentation.**—If the *cervix* be only *slightly dilated* you can feel the hard vertex if presenting, but may *readily mistake* other forms of presentation, *e.g.* breech for face. When the *cervix* is *well dilated* you can, by sweeping the fingers over the presenting part, and recognizing the

various landmarks, rapidly determine the presentation, *e.g.* sutures and fontanelles for vertex; eye, nose, mouth, for face, etc.

**Diagnosis of Position.**—To diagnose the position, note the parts that lie anteriorly and posteriorly, *e.g.* in L.O.A. the small fontanelle is to the front and left; the sagittal suture lies in the right oblique. When a *large caput succedaneum* has formed, detection of the various diagnostic points may be very difficult, or impossible. (For details, see diagnosis of various presentations. For other points to be noted by vaginal examination, see "Management of Normal Labour," p. 142.)

#### 4. Bimanual or Combined Examination.

Two fingers of one hand are inserted into the vagina, the other hand is placed over the hypogastrium, and the presenting part bimanually palpated. It is *used to fix* the *presenting* part when not engaged in the pelvis, so as to permit the vaginal fingers to explore it more thoroughly and satisfactorily. It is of *great use* in estimating the size of a hydrocephalic head. Its *greatest value* is, however, in estimating the size of the head in relation to a deformed pelvis, when the head will not enter the brim. If the head is found to *overlap* the *symphysis pubis* in a *medium degree* of narrow pelvis, forceps will not be successful, so symphysiotomy, craniotomy or caesarean section will be indicated.

### VI. Diagnosis and Mechanism of the Four Positions in Vertex Presentations.

**First Cranial Position; L.O.A., Left Occipito-Anterior; First in Frequency; 74 per cent.** (Figs. 43 and 44).—Long diameter of head, occipito-frontal in right oblique, occiput left anterior. Right parietal to front. *Diagnosis, External.*—First grip, Fig. 55, breech in fundus; second grip, Fig. 56, back to left, small parts to right; fourth grip, Fig. 59, head at brim; cephalic prominence *right* side if head engaged in pelvis. Heart heard loudest to *left* and *below* umbilicus. *Vaginal Examination.*—*Os small*; feel hard head. *Os dilated.*—Note head by hardness, roundness, sutures, fontanelle. Note small fontanelle *left* anterior, sagittal suture in right oblique. Right



parietal lies anterior. After birth of child, see *primary caput succedaneum* over posterior superior part of right parietal (Fig. 52). *Secondary caput* over occiput and posterior fontanelle. *Head moulding*.—O.M. diameter lengthened; S.O.B. and O.F. diameters shortened; shape of head as in Fig. 53.

- |   |   |
|---|---|
| Descent goes on all the time.   | 1. Flexion.                                   |
| 1. Flexion; occiput dips.   | 2. Engagement downwards and backwards.        |
| 2. Internal rotation; occiput rotates to front through $\frac{1}{8}$ circle.      | 3. Rotation into conjugate; occiput to front. |
| 3. Extension; occiput passes under pubic arch, and sinciput sweeps over perineum. | 4. Birth of head by extension.                |
| 4. Restitution and external rotation; occiput to left.                            | 5. External rotation.                         |

**Second Cranial Position; Second Vertex; R.O.A., Right Occipito-Anterior; Third in Frequency, 5 per cent.**—Long diameter of head in left oblique, occiput right anterior. *Diagnosis*.—*External*; breech in fundus, back to right, small parts to left, head at brim, cephalic prominence left side; heart loudest to right and below umbilicus. *Vaginal Examination*.—Small fontanelle *right* anterior, sagittal suture in left oblique, left parietal lies anterior. *Primary caput* over superior posterior part left parietal. *Secondary caput* over occiput and posterior fontanelle. *Head moulding* and shape of head as above (Fig. 53).

- |  |   |
|--|---|
| Descent goes on all the time.  | 1. Flexion.                                   |
| 1. Flexion; occiput dips.  | 2. Engagement downwards and backwards.        |
| 2. Internal rotation; occiput rotates to front through $\frac{1}{8}$ circle. | 3. Rotation into conjugate; occiput to front. |
| 3. Extension, as above.  | 4. Birth of head by extension.                |
| 4. Restitution and external rotation; occiput to right.                      | 5. External rotation.                         |

**Third Vertex or Cranial Position; R.O.P., Right Occipito-Posterior; Second in Frequency, 20 per cent.**—Long diameter of head in right oblique, occiput posterior. *Diagnosis*.—*External* as in R.O.A., but foetal small parts are more easily felt. *Vaginal Examination*.—Bregma left anterior, sagittal suture in right oblique, left parietal lies anterior. *Primary caput* over superior *anterior* part left parietal bone, which lies to front.

*Secondary caput* over occiput and posterior fontanelle. *Head moulding* and shape of head as above (Fig. 53).

- |   |  |
|---|--|
| Descent goes on all the time.   | 1. Flexion.  |
| 1. Flexion ; occiput dips.  | 2. Engagement downwards and backwards.                 |
| 2. Internal rotation ; occiput makes long rotation to front through $\frac{3}{8}$ circle. | 3. Rotation into second position, then into conjugate. |
| 3. Extension, as above.   | 4. Birth of head by extension.                         |
| 4. Restitution and external rotation ; occiput to right or left.                          | 5. External rotation.                                  |

**Malrotated R.O.P., Persistent Occipito-Posterior** (Figs. 50, 51 and 54).—In malrotated cases the *secondary caput* is over the Bregma (Fig. 52). *Head moulding*.—The S.O.B. diameter is lengthened, the O.F. and O.M. diameters shortened, and the shape of the head as in Fig. 54.

## FAVOURABLE.

## UNFAVOURABLE.

- |  |   |
|--|---|
| 1. Flexion ; occiput dips.   | 1. Slight extension ; sinciput dips.  |
| 2. Internal rotation ; occiput passes into hollow of sacrum.   | 2. Internal rotation ; sinciput is rotated to front, and occiput passes into hollow of sacrum.        |
| 3. Flexion ; region Bregma impinges under pubic arch, occiput sweeps over perineum, then by extension brow and face come out under pubic arch. | 3. Flexion ; occiput sweeps over perineum, then by extension brow and face come out under pubic arch. |
| 4. Restitution and external rotation.  | 4. Restitution and external rotation.   |

**Fourth Vertex or Cranial Position ; L.O.P., Left Occipito-Posterior ; Fourth in Frequency, 1 per cent.**—Long diameter of head in left oblique, occiput left posterior. *Diagnosis*.—*External*, as in L.O.A., but foetal small parts are more easily felt. *Vaginal Examination*.—Bregma right anterior, sagittal suture left oblique, right parietal lies anterior. *Primary caput* over superior anterior part right parietal bone, which lies to front. *Secondary caput* over occiput and posterior fontanelle. *Head moulding* and shape of head as in other normally rotated cases (Fig. 53).

- |  |   |
|--|---|
| Descent goes on all the time.                                | 1. Flexion.   |
| 1. Flexion ; occiput dips.                                   | 2. Engagement downwards and backwards.                |
| 2. Internal rotation ; occiput makes long rotation to front. | 3. Rotation into first position, then into conjugate. |
| 3. Extension.  | 4. Birth of head by extension.                        |
| 4. Restitution and external rotation to left or right.       | 5. External rotation.                                 |



**Malrotated L.O.P., Persistent Occipito-Posterior.**—In malrotated cases the *secondary caput* is over the Bregma (Fig. 52). The mechanism is favourable or unfavourable, and the description is the same as under malrotated R.O.P. The head moulding is also the same (see Fig. 54).

## VII. Management of Normal Labour.

Always go to a patient when first called, as the sooner it is determined whether labour is likely to be normal or abnormal the better for mother and child.

Normal labour requires no interference, and your sole duty is to ease the patient's sufferings and to protect her against septic infection, the greatest of all the dangers of childbirth, by an absolute asepsis and antisepsis in ourselves and the surroundings of the patient.

### 1. Contents of Midwifery Bag.

(1) Male gum elastic catheter, No. 10; (2) syphon douche, glass vaginal tube, metal intra-uterine double channel catheter; (3) Higginson's syringe (must not be used for bowel); (4) axis-traction forceps; (5) pelvimeter; (6) needle-holder, full-curved needles, silkworm gut, catgut; (7) scissors; (8) nail brush, ethereal soap solution (acts also as a lubricant); (9) lysol or other antiseptic (lysol 1 per cent. acts as lubricant); (10) hypodermic syringe; (11) hypodermic solution ergot; (12) opium gr.  $\frac{1}{2}$  tabloids, quinine, chloral; (13) chloroform, mask, tongue forceps; (14) thermometer, stethoscope; (15) de Ribe's bag and forceps; (16) sterile iodoform or aseptic gauze; (17) rubber gloves; (18) sterile gown. Patient should have in house, cotton wadding or gamgee and safety pins, etc.

### 2. Lying-in Room.

This should be large and airy, and kept well ventilated. If the usual bedroom is small, and one has a choice of rooms, a large sitting room may be converted into a temporary lying-in chamber. If possible, it should not be near a lavatory or closet. A fire should be kept burning day and night, and the temperature of the room must be kept about 64° F. There should be

a special cot or crib for the baby, in which it should sleep from the first, as it is a bad practice for the child to sleep with the mother.

### 3. Monthly Nurse's Preparations.

The nurse must have ready a plentiful supply of clean towels, boiling and cold water. The cold water should be sterilized by boiling, and then allowed to cool in clean jugs or ewers covered by a towel. She airs the infant's clothes before the fire, sets the bed-pan to warm at the fire, and sees that the hot-water bottle and baby's bath are in readiness.

*Arrangement of Table.*—On a table covered with a clean towel she arranges basins, antiseptics, sterilized nail brush, soap, hot and cold water, gamgee tissue for sponges and diapers, towels, ligature for cord, binder and strong pins.

*Preparation of Bed.*—A narrow bed with a hard mattress is best. A spring mattress can be stiffened with boards. Over the mattress place a large waterproof sheet, covered with a blanket and sheet. This is for future use. Over this place another waterproof, blanket and sheet hanging well over the bedside. This is removed after labour is over. In midwifery practice amongst the poor the bed can be protected by brown paper, or even newspapers, covered by a sheet.

*Preparation of Patient.*—The nurse should empty the patient's rectum by an enema of one pint soapy water containing half an ounce each of castor and olive oils at the very beginning of labour, before the patient has her bath, or, failing a bath, before the region of the vulva is cleansed (see under "Disinfection"). The patient must not go to the lavatory, but must defaecate into a bed-pan or chamber-pot in the room. After evacuation of the bowel, the region of the anus should be carefully cleansed with an antiseptic.

*Dress of Patient.*—A woollen semmit should be worn next the skin to maintain warmth. Over this she wears a night-dress, which is rolled up to the armpits to keep clean and have ready to pull down after labour is over. As an additional protection against chill, a clean petticoat and warm, clean stockings may be worn. These are easily removed at the end of labour.



#### 4. Disinfection.

The necessity for absolute cleanliness is of the utmost importance, as every parturient woman must be regarded as a surgical case with a large, open wound in the uterine cavity represented by the placental site, and a number of smaller wounds due to tears of the cervix, vagina and perineum. Every care must be taken to avoid infecting these, since any carelessness in this respect will lead to puerperal sepsis, a cause of death and morbidity still far too frequent. A midwifery case should be conducted with the same precautions and the same care with which one performs a surgical operation.

Thoroughly wash your hands and arms before leaving your house, and put on clean linen. If you have been at an infectious case, or conducted a *post-mortem* examination, it is safer not to attend a labour the same day. If you must attend, then take a full bath, wash the head, put on an entire fresh change of linen and clothes, and at the labour wear rubber gloves, in addition to disinfecting the hands.

In the labour room take off the coat, roll up the shirt sleeves above the elbows and put on a sterile gown.

*Disinfection of Hands.*—Thoroughly scrub the arms and hands with soap solution, using a hard nail brush made aseptic by boiling just before use. Pay special attention to the nails by having them cut short, and scrape and brush well round and under the edges. Next wash and soak arms and hands in 1 per cent. lysol or 3 per cent. septoform. There is no better disinfectant for the skin than biniodide of mercury, 1 in 500 to 1 in 1000 in 85 per cent. alcohol, but this is too bulky for general practice. Tablets can be carried, and a 1 in 1000 watery solution prepared, but an antiseptic lubricant is necessary for the fingers if mercury is used, owing to the latter's astringent action. Disinfect the hands again before each examination, and examine with the hand taken directly out of the antiseptic. You must not dry the hands on an ordinary towel, as this undoes the previous disinfection, unless the towel be sterilized. The fingers must not be lubricated with ordinary vaseline, but if a lubricant is required with a non-irritating antiseptic taken directly from a collapsible tube such as K.Y. jelly. The lysol solution is usually a sufficient lubricant for the fingers, if they are kept wet with

it. If rubber gloves are worn, they are sterilized by boiling, and are easily drawn on if previously filled with sterilized water.

*Patient.*—The patient should have a full bath before or at the onset of labour. If this be impossible, the nurse should cleanse the parts about the vulva. If the labial hair is long, it is better cut short, as the vulva is easier cleansed during the puerperium. Long hair mats with the lochia. A vaginal douche is not necessary, unless there are suspicions of gonorrhoea, as it washes away the bactericidal protecting mucus.

If suspicious of gonorrhoea, disinfect the vagina and cervix as thoroughly as possible, to avoid the risk of the child's eyes being infected.

The vulva must be carefully cleansed by swabbing from before backwards before each vaginal examination (see method, p. 134). If the cotton wadding or gamgee is not already sterilized, then the pieces to be used as swabs should be disinfected by soaking in 1 per cent. lysol, from which they are wrung dry just before use.

*Instruments.*—Boil all instruments just before they are used, to render them thoroughly sterile. Those which cannot stand boiling, such as the gum elastic catheter, must be disinfected by prolonged soaking in an antiseptic.

Special midwifery bags are now made containing a sterilizer, in which the instruments can be boiled just before or after going to the patient's house.

A method which can be carried out in the humblest house is to roll all the instruments likely to be required in a clean towel and boil them in a fish kettle, or failing this, in an ordinary kettle, if first one end and then the other is placed in the water for ten minutes each. The bundle is laid in a clean basin to cool, and the towel only opened out as the instruments are required.

### 5. Examination of Patient.

*General Enquiries on Arrival in Lying-in Room.*—Enquire if the waters have come away; if so, disinfect the hands and examine at once. Otherwise make the following enquiries, if not already known, as aiding prognosis: (1) if a multipara, what like were her former labours and puerperia; were forceps required? (2) health during pregnancy; (3) now ask about



“pains,” when they began, where felt, strength and how often they come ; (4) enquire as to bowels and bladder (see “Management of First Stage,” under).

*General Examination.*—Note the patient’s general condition, appearance, pulse, and if indicated, the temperature. If there is any suspicion of possible pelvic deformity, as judged by signs of former rickets, stunted growth, narrow hips, then carefully measure the pelvic diameters (see under “Pelvimetry for Abnormal Pelves,” p. 190).

*Abdominal Examination.*—Thoroughly wash the hands and make an external examination by the methods described on p. 132. Note the size, shape and position of the uterus, and the height of the fundus. Diagnose the lie, position and presentation of the foetus as determined by what foetal part is found in the fundus and over the pelvis and to which side the small parts and back are felt respectively. The position of the head in the pelvic brim in cephalic lie is of great importance. If it is fixed in the pelvis, then all is right so far, but should it be above the brim and movable, or lie to one side, then there is some abnormality interfering with its engagement and demanding further investigation as to the cause. Next auscultate and note the point of maximum intensity of the foetal heart sounds and their nature. Suspend palpation during a pain, as the uterus is too hard to feel the foetal parts, but take the opportunity to note the strength and duration of the uterine contraction.

*Vaginal Examination.*—Now disinfect the patient’s vulva and your hands, and make a vaginal examination (for method, see p. 134, and disinfection, p. 140).

Commence the vaginal examination at the beginning of a pain, and continue after it is over, as you can thus better tell the extent of dilatation of the cervix and the shape of the bag of membranes.

*Note.*—1. That the patient is really in labour.

2. State of perineum and vagina.

3. Position of os, its size and condition of edges.

4. Whether the bag of membranes is ruptured or not ; if unruptured, estimate the amount of the forewaters by the size of the bag ; also note the shape, whether watch-glass shape as normally, or sausage shape as indicating some abnormal condition, such as a malpresentation or deformed pelvis.

5. Nature of presentation, whether the hard head presents, and if not, what other part.

6. Position of presenting part by noting in what oblique diameter the sagittal suture lies, and what fontanelle is to the front, to right, or left, if the vertex present. If the presentation is abnormal, determine the position by noting the various landmarks, be it brow, face, breech or shoulder.

7. Is the head fixed in the pelvis or movable above the brim?

8. If the membranes are ruptured, note the size of the caput succedaneum.

9. Sweep the fingers round the pelvis and note any irregularity in shape or roominess. If the sacral promontory is too easily reached by the fingers the pelvis is deformed (see "Flat Pelvis"), so measure the diagonal conjugate.

10. If the head has descended into the pelvis, the extent of its descent can be estimated by the amount of sacrum which can be palpated.

11. If the head is not engaged in the pelvis, make a bimanual examination (see method and value, p. 135).

12. On withdrawing fingers, note if they are blood or meconium stained. Meconium denotes a breech presentation or, if a head case, undue compression of foetus.

After the examination is completed, wash the hands in a disinfectant, and dry with a fresh, clean towel.

If satisfied, do *not* examine again till the membranes rupture, then examine at once to confirm the position and presentation, and note any possible complication, *e.g.* prolapse of cord, arm, etc. *Dangers commence after* the membranes rupture, so keep a careful watch over the patient and *foetal heart sounds*.

*After examination* two questions are usually asked, (1) Is all right? If *so*, tell patient; if *not*, tell friends, but assure the patient that so far all is well. (2) When will it be over? Never predict an hour, but say that it depends on her pains, and that the stronger the pains the sooner the labour will be over.

#### 6. Management of First Stage.

If not already given, order an enema. The patient may walk about till the pains become strong or the os is at least half dilated, when it is better for her to go to bed. It is



recommended that the patient, when in bed, should lie on the left side in L.O.A. and L.O.P. positions, and on the right side in R.O.A. and R.O.P. positions, since this favours descent of the occiput and rotation to the front, owing to the fundus uteri with its contained breech inclining to the side on which she lies.

Let her cry out. Prevent her "bearing down," as it does no good, exhausts her for the second stage, and risks premature rupture of the membranes.

Examine vaginally *only once* before the membranes rupture, unless otherwise indicated. On *no* account rupture the membranes before the os is fully dilated.

Watch the bladder, as if it become distended it favours inertia of the uterus. A full bladder can be seen and felt as a fluctuating tumour in front of the uterus just above the symphysis pubis. If the patient cannot urinate, pass a sterile gum elastic male catheter under guidance of sight after thorough disinfection of the meatus.

The nurse presses over the sacrum during a pain, this giving great relief to the patient. If the labour is prolonged, sustain the patient's strength by light liquid diet such as milk, meat juice, soups, and if she has no desire for food she should be persuaded to take this necessary nourishment.

If the patient is weary or restless, a dose of opium gr.  $\frac{1}{2}$  or chloral gr. 15 is good, and can be repeated in two to four hours if beneficial (see "Narcosis during Labour," p. 149).

Remain no longer in the room than is necessary to make a thorough examination, and note the progress of the labour.

If the os is less than a crown piece you may leave the house, but leave word where you are to be found, and return in a few hours. If at night, leave word to send for you if the pains become severe or the membranes rupture. If labour is near the end of the first stage, remain in the house but not in the room.

If the first stage is becoming too prolonged, the temperature should be taken, the frequency and condition of the pulse noted, and the foetal heart auscultated at intervals, as these give indications of possible necessity for interference (see "Pathology of Labour").

### 7. Management of Second Stage.

The patient may lie on her back or on her left side, the usual position in Britain. Examine vaginally as soon as the membranes rupture to confirm the presentation and position, and to see that the cord is not prolapsed. Only examine again if required to note progress. Should the membranes not burst when the os is fully dilated, rupture them while tense by finger or scissors. Encourage the patient to bear down during the pains, and not cry out. She is aided in this by pulling on a towel fastened to the head of the bed, and by pressing on a stool placed at the foot. The nurse palliates the pain in the back by pressing hard over the sacrum. Relieve cramp in the legs by friction or wrapping a towel round the legs.

You may give chloroform to the extent of obstetrical anaesthesia if it be desired to relieve pain (see "Narcosis during Labour," p. 149).

During the entire second stage auscultate the foetal heart frequently, as you can thus detect threatened asphyxia from pressure on the cord and thus deliver promptly if indicated. If faeces is being expelled by the advancing head, the nurse removes it with wadding and cleanses the anus carefully with an antiseptic lotion.

*Head at Outlet.*—If the perineum is rigid, apply a succession of wet cloths as hot as can be borne. This promotes softening and favours dilatation.

*Support of Perineum* (Fig. 60).—It would be better to speak of protection of the perineum. It is not support of the perineum with the hand that prevents tearing, but the proper management of the head. Protection is given by preventing the head advancing too rapidly, by not allowing it to extend and by keeping it flexed, so that it escapes in its smallest diameter, viz. the suboccipito-bregmatic and suboccipito-frontal peripheries, and thus distends the vulva and perineum to the minimum possible. Both hands are used for this purpose, as shown in Fig. 60. The left arm is passed between the thighs if the limbs are straightened to avoid threatened rupture of the perineum. Place a protective sterile pad of gamgee over the anus for the right hand to lie on to avoid soiling with faeces or bacillus coli.



*Threatened Rupture of Perineum.*—To avoid threatened rupture straighten out both lower limbs and extend them well backwards, the nurse holding up the upper limb while you protect the perineum.

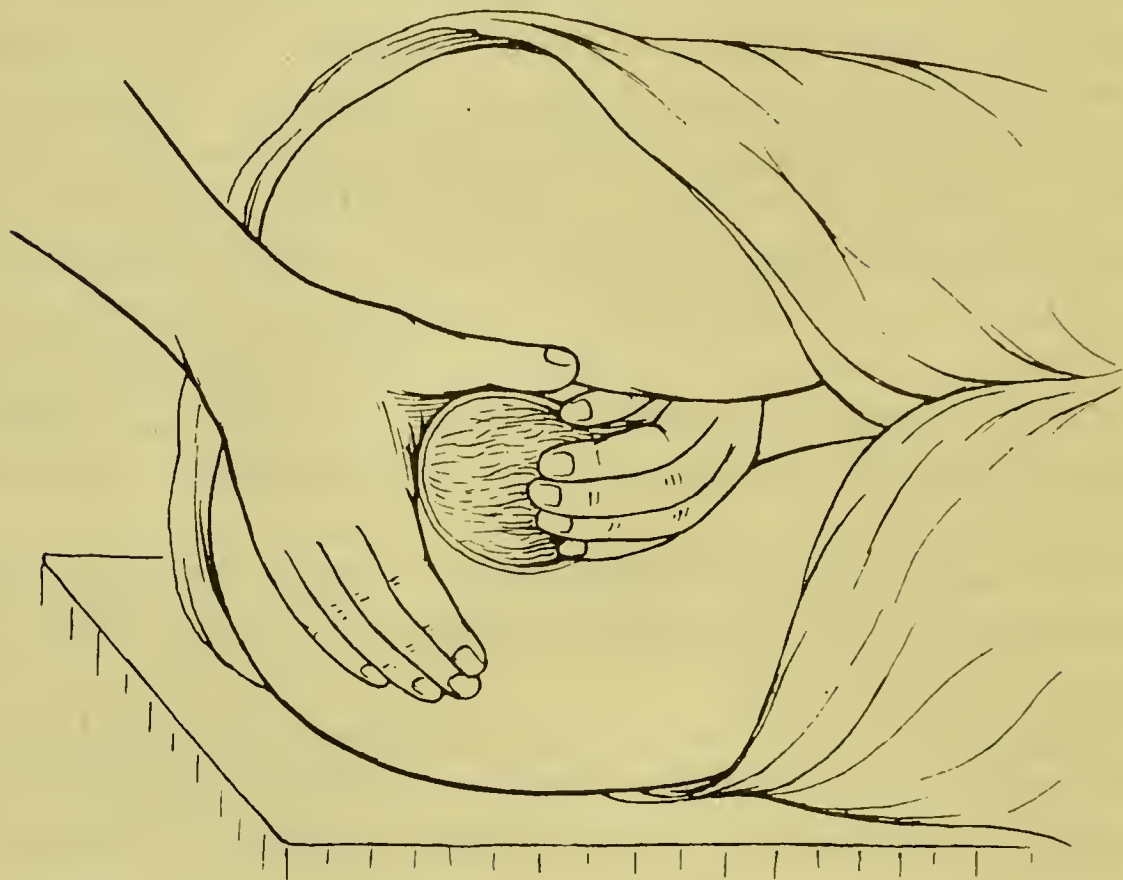


FIG. 60.—METHOD OF SUPPORTING THE PERINEUM BY KEEPING THE HEAD FLEXED AND CHECKING ITS TOO RAPID EXPULSION.

If this do not suffice, episiotomy may be done. This is a lateral incision made by scissors one-half inch deep, cutting one inch from the frenulum in the direction of the ischial tuberosity. This incision, if made, should be sutured, especially if it tear further.

*Delay of Head at Outlet.*—A method that is sometimes of value in multiparae, when the head is delayed at the outlet, is to press with the fist, protected by a pad of sterile gamgee, in the region of the coccyx, to prevent the head receding in the intervals between the pains, and to help it onward during the pains.

*After the head is born* feel if the cord is round the neck. If so, loosen a loop and slip it over the head. If this fail, ligate in two places and cut between. Wipe the eyes with moistened wadding, and clear mucus from the nose and mouth. During the birth of the shoulders again protect the perineum by pushing the shoulder forward, as it may tear, or a small

tear may increase. If there is delay in the birth of the trunk, do *not* pull on the head, and if the child breathe do not hurry. If the child's face remain cyanosed and speed is required, excite the uterus to contract by pressure on the fundus or friction, and get the patient to bear down. If this fail, express from above, or hook a finger into the posterior axilla, and pull it back to let the anterior shoulder come out under the pubic arch, then pull the posterior shoulder forward and upwards over the perineum. Extract with caution, as undue force may fracture the humerus.

While the trunk is being born, keep the left hand on the fundus uteri, and follow it down. This ensures proper retraction, prevents haemorrhage, and lets us recognize a possible plural birth, in which case the fundus uteri does not sink.

*After the child is born* turn the patient on her back. Give the fundus uteri to the nurse to hold while you attend to the child. Cover the patient and protect her from cold. If the child does not breathe well, hold it up by the feet, slap the nates, and sprinkle cold water over it to stimulate the reflexes. If there is no necessity for haste, as from uterine haemorrhage, or asphyxia of the child, wait till the cord stops pulsating—about five minutes—before applying the ligature. *Ligate the cord* one and a half to two inches from the abdomen, and cut one-half inch beyond. A second ligature is not necessary except for twins, but one may be tied close to the vulva as a guide to show separation of the placenta. If the *perineum* has been torn and *requires* stitching, it may be done now, especially if the patient is under the influence of chloroform anaesthesia.

### 8. Management of Third Stage.

Keep the hand on the fundus uteri, which at the beginning of the third stage is about the level of the umbilicus. If the uterine contractions are feeble, try the effect of gentle friction, but on no account massage or squeeze the uterus to try and separate the placenta.

*Signs of Separation of the Placenta.*—When the placenta has been separated and expelled into the lower uterine segment and vagina, note

1. That the body of the uterus is smaller, and is no longer spherical, but is flattened antero-posteriorly.



2. That the fundus uteri has risen higher—about two inches.

3. That the lower uterine segment is distended, and forms a tumour palpable above the pubes.

4. That five or six inches more cord project from the vulva, easily seen if a ligature has been placed round the cord close to the vulva.

Separation and expulsion occur spontaneously within thirty minutes in about 60 per cent. of cases, and about 14 per cent. during the second hour.

If it is recognized by the above signs that the placenta is separated, it is usual not to wait for spontaneous expulsion, but to express it by Crédé's method.

*Crédé's Method.*—Compress the body of the uterus during a contraction between the thumb and fingers of the left hand placed over the fundus, the thumb being in front and the fingers behind, and press downwards and backwards. As the placenta is escaping from the vulva, catch it in the right hand to prevent a sudden drag on the membranes, with risk of tearing them.

*Never forcibly express the placenta* before it is detached, as it may lead to haemorrhage, or the placenta may be expelled, leaving all or much of the membranes behind.

*Never pull on the Cord.*—It may cause after-haemorrhage, retention of portions of placenta, or inversion of the uterus.

*If the membranes are still adherent* after separation of the placenta and expulsion to outside vulva, hold the placenta in both hands, and twist it round and round to rope the membranes, but do not overdo the twisting or the membranes will tear. If the membranes still stick, pass the finger up to the cervix and gently pull on them. If a piece of membrane is left behind, on no account search for it, as this is more dangerous than leaving it. If the placenta remain an hour in the uterus and expression fail, it is probably more or less adherent, so under the strictest antiseptic precautions and previous cleansing of vulva and vagina pass a gloved hand into the uterus and separate.

*Never* put a hand into the uterus to separate a placenta unless *absolutely* indicated, as the danger of introducing sepsis is always great in spite of every precaution and care as regards asepsis.

### 9. Management after Labour is Completed.

Examine the placenta and membranes to see that they are entire and none left in the uterus. This is best done by floating them in a basin of water. If a piece of placenta is left it must be removed, as it causes haemorrhage or great risk of sepsis. Carefully examine the perineum, and if torn, stitch, if this has not been done before the placenta was born. (For method see under "Tears of Perineum," p. 270). Also examine the vestibule and region of clitoris, as tears in this situation can cause serious haemorrhage.

If necessary, owing to bad retraction or inertia of the uterus or haemorrhage, inject ergot deep into the buttock.

If satisfied that all is well, and the uterus properly retracted, cleanse the external genitals and apply a warm diaper. For diapers order gamgee, which can be cut up as required and burned after use. A vaginal douche is *not* necessary, and may do more harm than good. The nurse now removes all soiled bedding, and slips down the patient's clean night-dress. If the uterus is well retracted, apply a stout binder 14 ins. wide, tight round the hips below the trochanters, but only moderately tight above. The only value of a binder is the comfort it affords the patient. An abdominal pad under the binder is useless.

*Remain about one hour in the house, and before leaving see that (1) the uterus is well retracted; (2) there is no haemorrhage; (3) the pulse is below 80. Leave word to send for you at once if pelvic pain, rigors or faintness supervene (as pointing to possible haemorrhage).*

### 10. Narcosis during Labour.

#### OBSTETRICAL ANAESTHESIA.

*Chloroform* still holds its own as the best anaesthetic for blunting the sufferings of labour. Parturient women as a rule stand chloroform well, and cardiac disease or albuminuria are not contra-indications against its use. On the contrary, its use is indicated in cardiac disease to prevent the patient bearing down and permit the use of forceps during the second stage of labour.

For the purpose of blunting pain only small quantities are necessary, and these have no injurious effect either on the mother or foetus. Only with prolonged and deep narcosis to



the surgical extent for obstetrical operations is there a risk of post-partum haemorrhage or delayed chloroform poisoning owing to its toxic action on the liver. It also requires more prolonged, deep narcosis, than is likely to be required for any operation, to injure the foetus.

*First Stage Labour.*—It should never be given in this stage simply to annul pain.

*Second Stage Labour.*—Its use for obstetrical anaesthesia should be limited to this stage, and only during the pains. A few drops are sufficient to deaden suffering, the mask being applied whenever the patient feels a contraction beginning. The mask can be held by the patient herself, since several deep inspirations suffice to blunt the pain. The extent of anaesthesia should be so limited that the patient can still bear down; indeed, women who refuse to bear down owing to their sufferings will now do so when the pain of the uterine contraction is sufficiently deadened.

Prolonged or excessive use weakens the uterine contractions and inhibits the use of the accessory powers, thus labour is delayed and forceps may be required when not really necessary.

When the foetal head is coming over the perineum, deepen the narcosis by giving chloroform between the pains as well. This abolishes the agony, and, by checking severe bearing down, enables you more easily to support the perineum, and thus avoid tears.

Do not waken the patient, and she will sleep through the placental stage.

*Scopolamine*, gr.  $\frac{1}{200}$  to  $\frac{1}{100}$ , with *morphine*, gr.  $\frac{1}{6}$ , injected hypodermically, and repeated in a smaller dose in two or three hours. This method is not suitable for general practice, as the patient must be carefully watched. It delays labour by weakening the contractions; it must not be used in anaemic or weakly patients, or those suffering from cardiac or lung affections; it also affects the foetus, as many require artificial respiration after birth.

*Lumbar or sacral anaesthesia* by novocaine injections into the spinal canal. This is not free from danger, and may cause uterine inertia. It is not suitable for general practice, and it is questionable if its use is at all justified when time has proved the certainty and safety of chloroform with its ease of administration.

*Opium* gr.  $\frac{1}{2}$  to 1, *morphine* gr.  $\frac{1}{8}$ , *chloral* gr. x to xx. These are not suitable for general anaesthesia, but are of value, especially in the first stage of labour, for soothing the patient and regulating the pains when chloroform should not be used for this purpose.

Large or frequent doses of morphine have an injurious effect on the foetus, which may be born so narcotised as to require prolonged artificial respiration.

*Phenazone*, and other antipyretics of a like nature, have only a slight effect in easing suffering.

### **Surgical Anaesthesia.**

Deep narcosis to the surgical extent is required for all obstetric operations. Although chloroform is most generally used for this purpose, there are some who have abandoned its employment, and prefer ether. Others, again, condemn the use of both these anaesthetics for surgical interference in the toxæmias of pregnancy, and prefer a mixture of nitrous oxide gas with oxygen.

### **11. Drugs used During Labour to Promote Uterine Retractions.**

*Ergot*.—Ergot administered during pregnancy does not promote uterine contractions; its action, apart from labour, being that of a haemostatic. If uterine retractions have already begun, labour being in progress, ergot increases their force, and will make them tonic (see “Tonic Contraction of Uterus”) instead of intermittent. Ergot is, therefore, dangerous to mother and foetus, and must never be used under any circumstances in the first stage of labour. This rule applies equally to the second stage, with one exception. The author has, with good effect, injected ergot just as the head was coming over the perineum in cases of primary inertia of the uterus dating from the first stage. Ergot should also be avoided during the third stage—unless necessary for inertia uteri—as it may cause hour-glass contraction, with incarceration of the placenta. The great value of ergot is in the prevention or treatment of post-partum haemorrhage, and it is given as soon as the placenta is expelled, to cause permanent retraction of the uterus. Ergot is also of value in promoting contraction of the uterus in cases of subinvolution during



the puerperium. Ergot is not required in normal labour, but there is no harm in using it as a preventative when the obstetrician lives at a distance, as in country practice.

*Dosage and Administration.*—The liquid extract may be given in a  $\mathfrak{z}\text{i}$ – $\mathfrak{z}\text{ij}$  dose, repeated if indicated. Ergot given by the mouth takes from ten to twenty minutes to show its effect. Therefore, in all cases where a rapid effect is desired in two or three minutes, it should be given intra-muscularly in a 10 minim dose by plunging the hypodermic needle straight into the gluteus over the nates. Never inject it subcutaneously, but only into muscle. The skin at the site of puncture must be thoroughly cleansed, and the needle must be sterile. As a patient's life may depend on ergot, only use those brands whose activity is guaranteed. Hermetically sealed glass capsules containing 10 minims of ergot are convenient, as they are sterile, and do not deteriorate. Ernutin  $\mathfrak{m}\text{v}$  to  $\text{x}$  injected intra-muscularly acts rapidly and powerfully.

*Pituitary Infundibular Extract.*—This is an extract of the fresh posterior lobe of the pituitary body, which has a special action on the uterus, causing uterine contractions, and is, therefore, used in cases of uterine atony and resulting post-partum haemorrhage. It is also employed clinically in cases of shock and intestinal paresis. The dose is  $\mathfrak{m}\text{xv}$ , equal to 3 grs. of fresh gland, and it must be given by intra-muscular injection, but not before the completion of the third stage. The author has not been convinced of its superiority over reliable ergot or ernutin in treating atony of the uterus and post-partum haemorrhage.

*Quinine.*—Quinine is an uncertain drug for stimulating uterine contractions, as, while it seems to act in some cases, it has no effect in others. It may be tried for primary inertia in the first stage of labour by giving gr. v, repeated every two hours, till three doses or gr. xv in all are taken.

## VIII. The New-born Child.

### 1. Establishment of Respiration.

The child begins to breathe as soon as it is born, and may even attempt to do so after the head is expelled, and while the trunk still remains in the parturient canal. The

stimulus to respiration depends on the venous state of the foetal blood, due to the retracted uterus compressing the placenta, and interfering with the exchange of gases between mother and foetus.

The stimulation of the skin reflexes by irritation or cold also influences the act of respiration, and it is for this reason that when the new-born child does not breathe properly we try the effect of slapping the nates or sprinkling cold water on the trunk.

The first respirations are usually accompanied by vigorous cries; the child opens its eyes and moves its limbs, and the bluish colour of the body turns to a rosy red. Urine is frequently voided shortly after birth. The pulse is 120 to 136; the respirations 35 or more per minute.

As soon as respiration is established, the pulmonary circulation is completed in the following way: The first inspiration expands the thorax, and fills the alveoli of lungs with air. The blood from the right ventricle no longer goes through the ductus arteriosus, but flows into the dilated pulmonary vessels. The blood returning from the lung causes a greater tension in the left auricle than previously existed, and this presses the valve against the foramen ovale. Thus the communication between the right and left auricles is at once closed.

The various structures peculiar to the foetal circulation become obliterated (see "Foetal Circulation," p. 47).

## 2. Management of New-born Child.

After the cord is cut, wrap the child in a warm blanket till the bath is ready. The bath is about 100° F. If the vernix caseosa is sticky, first soften it by rubbing olive oil on the skin. Ethereal soap solution takes it off well. First carefully wipe the eyes with clean wadding, dipped in clean tepid water. The eyes must on no account be touched with the bath water. Then wash the head, and lastly the body and limbs. Thoroughly dry the skin with a warm soft towel, and dust the flexures with any simple dusting powder. Examine for any maldevelopment, especially cleft palate and imperforate anus. See that the cord is well tied, and apply another ligature if necessary, as it may be for a thick cord, then wrap the stump in sterilized linen or gauze, and lay it



upwards on the abdomen, where it is kept in position by the flannel binder.

Put a premature child in an incubator kept at a temperature of 100° to 105° F.

If a *purulent* vaginal discharge has been noticed, or if there is any *suspicion* of gonorrhoea, give frequent antiseptic vaginal douches during the labour, and as soon as the child is born, or within thirty minutes of birth at latest, *avoid* any possible risk of ophthalmia neonatorum by washing the eyes with 1 in 1000 hydrarg. perchlor., or drop into the eyes one drop of freshly made 1 per cent. silver nitrate or albargin, or 5 per cent. protargol. Crédé recommended 2 per cent. silver nitrate, but 1 per cent. is just as effective, and is less irritating.

### 3. Clothing of Child.

A flannel binder is first applied, which extends from thorax to pelvis, and it must be sufficiently loose not to interfere with respiration. No pins should be used to fasten the binder, which may be kept in place by simply folding the lower edge upwards. Next comes a woollen vest, then a woollen barry coat, and over this a woollen, or, in warm weather, a cotton nightdress. A square napkin of fine turkish towelling, folded diagonally, protects the genitals, and receives the urinary and alvine discharges; this in turn being covered by a woollen square, similarly folded, and fastened by a safety pin. The long barry coat is folded up over the legs, and fastened in front by two safety pins.

## PART V.

### PHYSIOLOGY OF PUERPERIUM.

THE puerperium begins after the placenta is born, and lasts from six to eight weeks, till involution of the uterus is complete and the endometrium is regenerated. The end of this period is indicated in nonlactating women by the return of menstruation; but even in women who suckle their children the menses may, in exceptional cases, return in two months post-partum. As a general rule, the menses do not return in lactating women for several months, usually about the seventh or eighth month, but may return as early as the fourth, or not till lactation is stopped, even if suckling is continued over a year.

As far as the physician is concerned, the puerperium is practically over in three weeks.

#### 1. Clinical Phenomena.

There is more or less nervous exhaustion, but the patient should look natural from the beginning; an anxious look is suspicious of something wrong, such as sepsis.

*Post-partum Chill.*—Rigors frequently occur just after the completion of the third stage, and last about ten or fifteen minutes, during which the patient complains of cold. It is of nervous or vaso-motor origin, has no significance, and requires no treatment beyond keeping the patient warm.

*Pulse.*—The pulse slows after labour, and remains about 60 to 70 for the first week or ten days. If it remain below 80 all is well. The pulse rate is, however, easily quickened from such slight causes as nervous excitement, but this is only temporary.



If the rate rise to 100 or over, and continue at this rate, something is wrong, and it may be the first indication of septic infection, especially if it begin on the third day.

A prolonged and exhausting labour, or a difficult forceps delivery, may cause it to remain quick for some days post-partum. It also remains quick after excessive loss of blood, or in heart disease. It may be unduly rapid in very neurotic women without any other obvious cause.

*Temperature.*—A normal puerperium should be free from any fever.

A temporary pyrexia may occur from copraemia due to constipation, from errors of diet, or even from nervous excitement.

Although the pain from the milk-engorged mammae about the third day may cause a slight temporary rise of temperature, especially in nervous women, lasting a few hours, there is no such thing as milk fever; so any rise of temperature about this time associated with increased pulse rate should be regarded as possible sepsis.

Septic absorption from lacerations of the soft parts may be responsible for a slight pyrexia about the third day or later.

A continuous elevation above 100° F. must be regarded as pathological, and is in most cases due to sepsis.

*Sweating.*—The patient perspires readily in the first week, especially during sleep, but it can be largely prevented by keeping the room well ventilated and avoiding too many blankets.

*Bowels.*—These tend to be sluggish, leading to constipation, which must be prevented by laxatives, as it causes much discomfort, aggravates haemorrhoids, and may cause pyrexia.

*Urine.*—This frequently contains milk sugar absorbed from the mammae, causing lactosuria, which is of no significance.

## 2. Puerperal Changes in the Generative Organs.

*Uterus.*—Immediately after labour the uterus is felt as a hard ball in the hypogastrium, the fundus being below the umbilicus and about a hand's breadth above the symphysis pubis. In six or eight hours it feels softer, the fundus rises to about the level of the umbilicus, and the body lies anteflected against the anterior abdominal wall. On the first day it weighs about 2 lbs., the cavity measures  $6\frac{1}{4}$  inches, and its total length about 8 inches. It diminishes slowly in size and

length for the first three days, but after this involution is more rapid. By the end of the first week the fundus is about midway between pubes and umbilicus, and the uterus weighs about 1 lb. By the eleventh day it is about 2 inches above the pubes, and by the fourteenth day the fundus is below the brim of the pelvis, and the weight is 12 ozs. In about six weeks, or even less, the uterus is normal parous size.

As the rate of involution varies in different women, the following table is only approximate:

Length in inches	1st day,	$7\frac{7}{8}$	whole uterus;	$6\frac{1}{4}$	cavity.
"	"	2nd "	$7\frac{1}{8}$	"	$6\frac{1}{4}$ "
"	"	3rd "	$6\frac{3}{8}$	"	$5\frac{5}{8}$ "
"	"	6th "	$5\frac{1}{8}$	"	$4\frac{5}{8}$ "
"	"	15th "	$3\frac{3}{4}$	"	$3\frac{3}{8}$ "

*Cause of Involution.*—The retracted uterus is in an anaemic condition, due to compression and thrombosis of the blood vessels, and also to the contractions (after-pains), which mostly occur during the first week. This anaemia leads to a partial fatty degeneration of the individual muscle cells, which thus become smaller.

Another view is that the cells get smaller by a sort of peptonization, aided by phagocytosis.

*Placental Site and Decidua Vera.*—The large area left in the uterine wall at the decidua basalis by the separation of the placenta through the spongy layer forms a rough, irregular open wound, containing the gaping ends of the torn deciduo-placental blood vessels. These vessels and the sinuses under the placental site are compressed and filled with thrombi, which become organized and shrink, leading to obliteration of the blood vessels.

The remaining decidual cells of the placental site and decidua vera undergo fatty degeneration, and are thrown off with shreds of tissue mixed with blood, mucus and pus. This is mixed with secretion from cervix, vagina and vulva, and escapes as a more or less copious discharge called the *lochia* (see below). A new endometrium is regenerated in three weeks from the deep layer of the mucosa and the remaining fundi of the glands, which provide the new epithelium. Blood and lymph vessels decrease in size and some become obliterated.



*Peritoneum*.—This shrinks and follows the involution of the uterus.

*Uterine Ligaments*.—These contract.

*Tubes and Ovaries*.—These shrink and regain their normal size and position.

*Cervix*.—The lips are soft and lax, and hang in the vagina as two loose folds, feeling like wash-leather. The canal is very patulous, but by the second day the cervix has contracted considerably, and the lips are harder and less swollen. By the tenth day the cervix has assumed its normal shape, and the os is too small to admit the finger. After involution is complete the cervix remains thicker than in the nulliparous condition, while the external os is more patulous, more transverse in shape, and more or less fissured, depending on the extent of the lacerations.

*Vagina*.—The walls are relaxed and smooth, and secrete freely. Examination may show lacerations due to over-stretching, which soon heal by granulation. The vagina gradually shrinks and returns to a parous size, being more patulous than before, and the walls losing the rugosity of virginity.

The ostium vaginae is laxer and more patulous, and very frequently a small protrusion of the anterior vaginal wall is seen, which patients may complain of, regarding it as a “falling of the womb.” It is of no import.

*Vulva*.—The swollen labia shrink to normal. The hymen is completely destroyed, and its remains are seen as small tags of tissue called the *carunculae myrtiformes*. The tears of the perineum heal by granulation, leaving a permanent whitish cicatrix, easily seen on opening the labia.

*Lochia and Bacteriology during a Normal Puerperium*.—The lochia is the discharge from the healing surface of the uterine cavity, mixed with the secretions of cervix, vagina and vulva. It is composed of degenerated decidual cells, pus cells from healing surfaces, mucus and blood, and microscopically you see debris, shreds of decidual tissue, decidual cells, red and white blood corpuscles, fatty cells, mucous cells, vaginal epithelium and cholesterin crystals.

It has a characteristic, heavy odour, and is at first alkaline or neutral, but later becomes acid. If the odour is at all foetid, then saprophytic organisms are present, and the discharge is septic.

The lochia is normally sterile in the uterine cavity, but in many afebrile cases pyogenic organisms are found, having reached the uterine cavity from the vagina. They probably only exist in small numbers, and possess little, if any, pathogenic power. The lochia in the vagina contains numerous micro-organisms, which are usually harmless, although even in a puerperium running a normal course streptococci and staphylococci may be found. On the vulva streptococci, staphylococci, and the bacterium coli commune are found in a large proportion of cases. One of the reasons for so strenuously insisting on the great necessity for thorough antisepsis and asepsis in the management of labour is the exceedingly favourable soil which the lochia presents for the development of saprophytic and pyogenic organisms.

The lochial discharge lasts for two or three weeks, but gradually diminishes from the first till it ceases. The total quantity averages from 20 to 30 ounces, but it varies considerably in different women, some losing very little, while in others the discharge is copious, this tending to be the case in women who do not nurse.

The colour of the discharge is at first red, but it changes to greenish, and finally whitish, for which reason the following names are applied: *Lochia rubra* or *cruenta* till about the fourth day. For the first two days it is quite haemorrhagic, then it becomes bloodstained. The discharge then becomes greenish—*lochia serosa*—and thin till about the ninth day. After this it is called *lochia alba*, being whitish, greyish, or creamy, and mucopurulent. Finally it becomes mucous and ceases.

*Mammæ*.—These become large and full till the milk secretion is established, usually on the third day (see "Lactation," p. 166).

*Abdomen*.—The skin is relaxed, wrinkled, and more or less marked with striae which later become white. The muscles are also relaxed, so that the abdominal wall can be puckered up. The abdominal wall rarely returns to its former condition, but remains more flabby from the former stretching, and thus protrudes more or less when the patient is in the erect attitude. Occasionally there remains a diastasis of the recti muscles, so that the fingers can be passed between them in the middle line where the abdominal wall feels thinner.



### 3. Diagnosis of Recent Childbirth.

A medical man may be called upon to diagnose recent parturition in medico-legal cases of concealment of pregnancy, so the following points should all be noted as detailed above.

*Mammæ.*—Note their size and appearance as described under “Signs of Pregnancy.” Note the quantity and character of the expressed secretion. Microscopically, you can detect colostrum corpuscles, which are numerous during the first three days of the puerperium, but get fewer during the next three or four days (see “Lactation,” p. 166).

*Abdomen.*—Note the wrinkled and relaxed condition of the abdominal wall. The striae, if recent, are coloured.

*Vulva.*—Look for recent injuries at the fourchette, especially in primiparae. The lochial discharge can be microscopically examined and the colour noted (see above). Look especially for shreds of decidual tissue and decidual cells.

*Vagina.*—Note its patulousness and the relaxed and smooth condition of its walls. Granulating wounds from recent tears may be seen.

*Cervix.*—The os is patulous to the finger for the first ten days or so. Note recent tears, especially in primiparae.

*Uterus.*—Note its large size and, if necessary, an examination can be made at a later date to show it is involuting. (For rate of involution and size at different dates see above.)

If the cervix will admit the finger, the rough feel of the placental site is very diagnostic.

*Probable date of birth.*—This may be approximately estimated by noting:

1. Whether lacerations are recent or not.
2. The degree of patulousness of the cervical canal.
3. The height of the fundus uteri above the symphysis pubis.
4. The size of the uterus estimated bimanually.
5. The length of the cavity as estimated by the uterine sound.

The bladder must be empty when determining the size of the uterus.

### 4. Management of the Puerperium.

*Lying-in Room.*—This should be kept well ventilated, and at a temperature about 64° F. The popular view still held by some

that it is dangerous to open the window as it may cause a chill or childbed fever is quite erroneous. Neither should the room be kept darkened by pulling down the blind.

*Bed.*—The mattress is protected from being soiled by the lochia by being covered with a waterproof sheet, over which is placed a single blanket and sheet, which are changed when soiled. As the patient perspires readily she should have just sufficient covering for warmth.

*Doctor's Duties.*—Daily visits should be made for the first six days, then every second day till about the end of the second week.

It is important to make the first visit not later than twelve hours after labour is completed, when special enquiry should be made regarding *micturition*, as not infrequently the patient is unable to empty the bladder during the first twenty-four hours owing to laxity of the abdominal wall, or to crushing of the soft parts between the foetal head and symphysis pubis during a prolonged second stage.

*Retention of urine* frequently follows as the result of suturing the perineum, and may continue for some days. Ergot administration sometimes seems to be responsible for retention. Do not trust the nurse as regards micturition, but palpate the bladder, since urination may be simply an overflow from the over-distended organ. A *full bladder* forms a soft fluctuant tumour palpable in the middle line above the symphysis pubis, but be careful not to regard it as the uterus which is displaced upwards, backwards and to the side, and may easily be overlooked by a careless examination (for treatment of retention, see below, "Care of Patient").

At each visit *enquiries* should be made as to urination, state of bowels, sleep, pain and the lochial discharge. The patient should be quite free from pain, except for after-pains, which are usual with multiparae during the first twenty-four or forty-eight hours. The *diaper* should be removed and inspected to note the character and odour of the lochia. The *pulse and temperature* should be taken, and if the former is below 80 all is well (see "Physiology of Puerperium, Pulse and Temperature," p. 155). Finally, palpate the uterus, note the height of the fundus and that involution is progressing normally. In noting the rate of involution be sure that the bladder is empty when palpating the uterus.



The *child* should also be inspected, and the shrivelling and separation of the cord noted, as also the healing of the wound left at the umbilicus after the cord drops off.

*Nurse's Duties.*—Bed sheets and night-dress are changed whenever soiled, and the nurse should remove all soiled linen and infant's diapers from the room. The patient's diapers should be of wadding or gamgee, which are changed as required, and burnt.

*Cleansing of Vulva.*—The nurse cleanses the external genitals morning and evening, and also after the bowels move. The patient lies on a warm bed-pan, and the nurse, while pouring warm sterilized water or antiseptic lotion over the vulva, wipes the parts from before backwards with swabs of wadding, a fresh swab being used for each wipe. Sponges should on no account be used for this purpose.

*Vaginal douches* are not necessary in a normal puerperium, and as they are a source of danger if carelessly given, this procedure should be carried out if indicated by the doctor himself.

The *binder* should be changed morning and evening, and should be applied only sufficiently tightly to afford comfort, its sole advantage.

As the patient cannot take a bath till the fourth week, she should be *sponged* every morning by the nurse.

The nurse should keep a note of the morning and evening *pulse and temperature*, and oftener if required for the doctor's inspection.

*Care of the Patient.*—No good case has been made out for the so-called rational puerperium, where the patient is encouraged to leave her bed on the third or fourth day, or submit to gymnastic exercises. She should remain in bed for ten days, but it is not necessary to lie on her back all the time. After the first two days she can turn on her side, if she wish, and towards the end of the first week recline on high pillows. She can sit up on the eighth and ninth days and rise for a few hours on the tenth or eleventh day. For the next week or ten days she should exercise caution, remaining out of bed for a little longer each day. If convalescence is satisfactory she may go out of doors during the fourth week. The patient should be kept quiet during the first week, and should receive no visitors, so as to avoid any excitement.

Except for after-pains during the first day or two she should be quite free from pain.

*Diet.*—A nursing mother requires more food than normally, but overfeeding must be avoided. For the first three days the food is chiefly milk, nourishing soups, and farinaceous food. After this, she gradually returns to her normal diet.

*Bowels.*—These should be opened in forty-eight hours. No laxative is so satisfactory as castor oil for thoroughly emptying the bowel, and if the taste is objected to it can be given in capsules. After this, a daily motion should be ensured, aided, if necessary, by laxatives, enemata or glycerine suppositories. Make certain that the bowels are thoroughly evacuated, especially in the first week, otherwise scybala readily collect and may cause great distress from tenesmus or haemorrhoids, or may cause a rise of temperature from copraemia.

*Bladder.*—This must be regularly emptied. If the patient cannot urinate, try the effect of hot moist clothes applied to lower abdomen and vulva, or the effect of pouring warm lotion over the vulva, while the patient is lying on the bed-pan. If this fail, let the patient try in a kneeling or even sitting position, so long as she is supported by the nurse, since this is preferable to using the catheter. If all fail, then use the catheter every eight hours.

*Precautions as to Use of Catheter.*—It must be passed under guidance of *sight*, the parts being exposed, and with the strictest *antiseptic* precautions, as if lochial discharge is carried into the bladder it will almost certainly cause *cystitis*. Open the labia with the cleansed fingers, thoroughly cleanse the meatus urinarius free of lochia with swabs soaked in an antiseptic, then take a freshly-boiled glass catheter, and pass the point directly into the urethra without coming in contact with the surrounding parts.

Do not trust the nurse to use the catheter unless sure she can pass it with the above precautions.

*After-pains.*—Contractions of the uterus normally occur during the first week of the puerperium, and if painful during the first day or two are called after-pains. Primiparae do not usually feel them painful, but, as a rule, multiparae feel them as intermittent attacks of colicky pain in the lower abdomen. Sometimes they cause more annoyance and suffering to the patient than the actual labour. Putting the child to the



breast excites these contractions, and the influence and importance of lactation is seen in the more rapid involution of the uterus which occurs in mothers who suckle their infants in contrast to those who do not.

*Diagnosis of After-pains from Pain due to Inflammation.*—The pain is not continuous, as in pelvic inflammation, but is intermittent and colicky, and is often more marked when the child is put to the breast. The uterus can be felt contracting during a pain. They cause *no* rise in pulse or temperature.

*Treatment.*—As a rule, no treatment is required, but if very severe and causing much suffering prescribe tinct. opii ℥x to xx.

Severe after-pains are sometimes due to the presence of blood-clot in the uterus. This should be expelled by gentle massage and compression of the uterus.

### 5. Infant during Early Days.

1. *Cord.*—The stump of the *cord shrivels* and is thrown off about the fifth to seventh day, but may be later. It leaves a granulating wound, which heals by the twelfth to fifteenth day. The obliterated umbilical vessels shrink to fibrous cords, and by retracting cause the sunken appearance of the navel.

2. *Epidermis* is usually thrown off in bran-like scales, from the third or fourth day, and lasts five or six days.

3. *Icterus.*—This is more or less common, especially in premature children. In slight cases it may only affect the face and chest, but in others the whole body may be jaundiced. It disappears in from three to fourteen days, according to its intensity.

There are two views as to its origin: (*a*) it is haematogenous, due to breaking down of red blood corpuscles; (*b*) it is hepatogenous, due to absorption of bile from the meconium in the colon.

4. *Swelling of Mammae.*—This is common in both sexes about the third or fourth day, and a colostrum-like fluid can be squeezed out. The swelling disappears in one or two weeks.

5. *Alvine Discharge.*—The stools during the first two or three days consist of dark-green, tarry meconium. After this the normal stools are a light canary yellow. Till the sixth

week the bowels move three or four times daily, but after this twice a day. The stool should be of the consistence of porridge, and have a slight sour smell. Micro-organisms appear in the faeces on the second day.

6. *Urine*.—The urine is clear and of a specific gravity of 1006. It sometimes contains a trace of albumen, and uric acid granules appear frequently about the sixth or seventh day, having been washed out from the kidney. They are of no import. A child urinates ten or more times in the 24 hours.

7. *Weight*.—The child loses in weight up to  $\frac{1}{2}$  lb. during the first three or four days, but this is regained by the tenth day. The extent of the loss is partly dependent on the amount of milk the mother can give it during the first week, but in any case the loss is less than is seen in artificially-fed infants. The discharge of meconium and shrivelling of the stump of the cord account for the rest of the loss.

#### 6. Hygiene and Management of Infancy.

For management of new-born child and clothing, see p. 153.

*Cleanliness*.—It is of the greatest importance that an infant be kept clean. Morning and evening it should have a bath at a temperature of about 98° F., or at least an evening bath and a morning sponging, and there is no necessity waiting till the cord drops off before commencing the daily bath, as some advise. The eyes are first cleansed, then the face sponged. The head is now held over the bath, washed and dried, after which the child is lowered into the bath for the body and limbs to be washed. The body is carefully dried by a soft, warm towel, and all flexures dusted to prevent excoriations.

*Napkins*.—A child will soil at least a dozen napkins a day, and these should be removed at once when wet. The skin is sponged, dried and powdered after removal of a napkin soiled with faeces. A good time to change the napkins is before each feeding if the child has been trained to be regular.

*Cord*.—The stump of the cord is dressed after the child is bathed, and oftener if the dressing is soiled. A simple sterile dressing and dusting with boric acid powder is all that is necessary. After the cord drops off, the granulating wound is smeared by a simple antiseptic ointment to prevent the dressing sticking to it. If not healing well, apply astringents; and if



granulations are redundant, touch with bluestone or silver nitrate.

*Mammæ*.—If swollen, caution the nurse not to rub or squeeze them, as this may cause mastitis. The swelling soon disappears, but should it persist a weak glycerine of belladonna and pressure is all that is required for treatment.

*Icterus*.—If not pathological, jaundice requires no treatment.

*Excoriations*.—These readily form about the genitals, groins and nates if the child is not kept clean, or is allowed to lie for long with a soiled napkin. Careful cleansing and dusting are absolutely necessary as a prophylactic. If they occur, apply a soothing ointment.

*Signs of Thriving*.—Regard the child as thriving—

1. If it falls asleep after feeding and only awakes at regular intervals for its meals, its desire for food being indicated by crying or restlessness.

2. If the napkins are frequently wet. If the child is uncomfortable from lying in a soiled napkin it will show this by restlessness, refusing to sleep or crying.

3. If the faeces are of normal colour and consistence, and not more than three or four stools are passed daily during the first six weeks, or not more than two stools daily after this.

4. If there is a regular increase of weight of from four to six, or even more, ounces per week, with increasing roundness and firmness of limbs.

## 7. Lactation.

From the second to the fourth day of the puerperium the mammae swell, and become hard and painful. This may cause a slight rise of temperature, especially in nervous women, lasting several hours, but this is *not* milk fever, as there is no such thing. The *so-called* milk fever of former days was *sapraemia* or *septicaemia*.

The *secretory* activity increases till the fourth day, and is kept up by the irritation of suckling and periodic emptying of the breast. The secretion increases till about the eighth month, then gradually fails, but it may last up to two years.

Menstruation is usually absent during lactation, but not infrequently appears about the fourth or fifth month.

Pregnancy may occur during this amenorrhoea, so that lactation does not always prevent ovulation.

By *non-lactation* the swelling and painfulness of the mammae increase to the fourth or fifth day, but two or three days later absorption occurs, and the breasts get small and shrink to their former size.

*Colostrum*.—The secretion for the first three days is *colostrum*, a watery alkaline fluid of 1024 to 1034 specific gravity, and containing yellow fat droplets. It contains, in addition, the characteristic colostrum corpuscles, rounded bodies of a mulberry appearance, and three to five times larger than the fat droplets, also fatty degenerated epithelial cells. During the next three or four days the colostrum gets less, and is gradually replaced by the true milk secretion.

*Milk*.—This is an alkaline, opaque, whitish fluid, of a sweetish taste, with a specific gravity about 1030, and is an emulsion of fine, fat droplets in a clear fluid.

*Chemical Composition*.—The analysis of different authorities varies considerably, as the following tables show :

Colostrum.	Milk.	Average Milk during 2nd week.
Protein, 3 to 9 per cent.	1·5 to 2 per cent.	1·7
Fat, 2·8 to 4 „	3 to 5 „	4
Sugar, 3·6 to 5 „	6 to 7 „	6·5
Salts, 0·3 to 0·5 „	0·2 to 0·3 „	0·2

The albumen of colostrum is chiefly globulin, and a little caseinogen; of milk, lactalbumen and caseinogen. Colostrum, therefore, coagulates on boiling, while milk does not. Human milk forms a fine curd on coagulation by gastric juice, and is soluble in excess. It is not precipitated by acetic, phosphoric, or nitric acids. This is in marked contrast to cow's milk, which forms a coarse curd not soluble in excess of gastric juice, and is not precipitated by these acids.

#### Conditions Affecting the Quality of Mother's Milk.

1. *Food*.—The composition of the milk is largely independent of the diet, though a highly nitrogenous diet makes it richer in fat. Malt liquors and alcohol also tend to increase the fat. Turnips taste it.

2. *Drugs*.—Bromides, chloral, opium, belladonna, iodides, salicylates, rhubarb, mercury, and other drugs, if given to the mother pass to the child through the milk, but the quantity is so small that they can be given to the mother



if indicated, provided the doses are small, and administration is not too prolonged.

3. *Moral Affections*.—Passion, mental shock, or fright, sometimes seem to affect the milk in such a way as to give the child diarrhoea.

4. *Menstruation*.—It is sometimes found necessary to discontinue nursing during menstruation, as the milk disagrees and causes dyspepsia.

### 8. Hygiene of Lactation.

*Importance of Nursing*.—Too many mothers, for social and other unsatisfactory reasons, refuse the (to them) onerous duty of nursing, an evil which the family physician should strenuously oppose. The mother should always nurse her child, unless it is specially contra-indicated, and the physician should insist on its importance, not only for her own sake, but for the welfare of the child, since the mortality is much higher in early life with artificially fed infants.

*Rules for Feeding*.—Put the child to the breast eight to twelve hours after labour, and regularly thereafter, even although little milk comes till the fourth day. If the milk secretion is delayed, the efforts at breast feeding should be persisted in, as the best stimulus for establishing the milk flow is regular suckling and thorough emptying of the breast. Each mamma should be used time about, and only one at a time.

The mammae are frequently hard and painful at first, but this can be relieved by gentle massage from the circumference of the breast towards the nipple. After each suckling the mother should wash the nipples free of saliva with a saturated solution of boric acid, and, after drying, smear them with an ointment containing bismuth subnitrate and borax, 1 drachm of each to 2 drachms of vaselin, and 4 drachms of adeps lanae hydrosi. This ointment keeps the nipples soft, and is a good prophylactic against fissures.

The mother should be warned to avoid touching the nipples when giving her breast to the child, as she may easily infect them, especially if her hands are soiled and small fissures are present.

The child should be put to the breast every two hours from 7 a.m. to 11 p.m., and once during the night, about

3 a.m. It is most important to train the child to regular habits from the very first day, and not to overfeed it during the night, nor give the breast whenever it cries. This gives the child dyspepsia, and the mother gets worn out from want of sleep by constant night-feeding. The child should be trained to sleep the whole night with only one feeding.

By the third month the intervals during the day are prolonged to two and a half or three hours. A healthy child will suck for fifteen minutes or longer, with rests between, if the milk flow is plentiful, and it should be allowed to take all it wants, as when it is satisfied it will leave go the nipple and fall asleep. It frequently takes more than it requires, but the excess is vomited, and does no harm.

The child should be put into its own bed to sleep after each meal, and laid on its side, so that when it vomits excess milk, which is frequently the case, the fluid can escape easily out of the mouth. If laid on its back the fluid might pass into the larynx.

The colostrum usually acts as a natural aperient during the first two or three days, so that opening medicine is not required in most cases.

#### Contra-indications to Nursing.

The mother should not nurse if suffering from renal or cardiac disease, sepsis, acute febrile diseases, tuberculosis, epilepsy, or insanity.

If the nipples are badly fissured and will not heal readily, or if mastitis threaten, stop nursing temporarily. If a mammary abscess form, nursing must be at once discontinued.

If the nipples are too small or depressed, making suckling too difficult or impossible for the child, it must be fed artificially, and all attempts at breast feeding given up.

If menstruation makes the milk disagree with the child, suspend nursing till the menses are over.

*Non-lactation.*—If for any reason the mother cannot nurse, the breasts should be firmly strapped with belladonna plaster and tightly bandaged. Glycerine of belladonna may be used instead of the plasters.

On no account should relief be given by drawing off any of the milk, as this only stimulates the mammae to further secretion, and prolongs the discomfort.



*Poor Milk.*—If the child is restless and hungry after a meal, and yet the milk seems plentiful enough, examine the milk as to its quality, and, if poor, try and improve it by giving the mother a highly nitrogenous diet, such as milk, eggs, malt, somatose and similar preparations.

*Scanty Milk.*—If a child is not getting enough nourishment it is restless, and has a whimpering cry; it does not increase in weight at the normal rate; it is constipated, and passes too little urine, recognized by its wetting too few napkins. A healthy child getting plenty of milk wets ten or more napkins daily. The breast feeding should be supplemented by artificial feeding, and a more generous diet given to the mother. If this fails, breast feeding may have to be stopped.

#### **Milk too Abundant or Exhausting to Mother.**

The milk supply may be normal or it is too abundant, yet it has an injurious effect on the mother. She becomes emaciated, weak and anaemic, and suffers from palpitation, headaches, loss of appetite, and weakness of the lower limbs. Nursing must be stopped at once before the symptoms become too pronounced, or recovery will be tedious.

If taken in time, and nursing is promptly stopped, a rapid recovery is got by generous diet, fresh air and iron tonics.

*Diet of Nursing Mother.*—No special diet is required for a healthy mother with a normal milk secretion, and she should eat what she has been accustomed to. If she is healthy, and her digestion is good, her appetite is keener, she naturally eats more, and has a desire for drinking a greater quantity of fluid than she usually takes. She takes enough nourishment, not only to supply her own bodily wants, but to provide sufficient milk for her child.

*Weaning.*—Under normal conditions the child should be weaned about the ninth month as a rule. The process of weaning should take from two to four weeks, beginning with one or two bottles a day, and increasing these till breast feeding is finally stopped.

Should pregnancy occur, the child must be weaned at once.

The other indications for weaning early are mentioned above.

### 9. Wet Nursing.

This is seldom used unless artificial feeding fails. In choosing a wet nurse attend to the following points: Go to her house, see her surroundings, and enquire as to her character. See to her general health, inspect her teeth, tongue and digestion. Exclude sore throat and tuberculosis in glands, lungs, etc. Look for signs of syphilis, and if there is the slightest suspicion of these reject her. Examine the mammae, and note if the nipples are prominent and easily held. What like is her milk? White milk shows richness in fat, and a drop placed on the finger nail should keep its shape on slight shaking. Blue milk is watery. The wet nurse's own child is the best clue. See that it is healthy, clean and well nourished, and that there are no spots nor fissures to suggest syphilis. Her own child must not be more than three weeks older than the child she is to nurse or the milk may not agree. A primipara of 20 to 25 is best. Give her the diet she is accustomed to, with a slight addition of nitrogenous food, and see that she does not overfeed, and takes plenty of exercise, and that she does not drug the child nor give it other food.

### 10. Artificial Lactation.

It may be necessary to resort to artificial feeding for reasons stated above, and for this purpose cow's milk is generally used.

There is no special advantage in using milk derived specially from a particular cow, as this may vary. It is really safer to give the mixed milk of the herd, as being more constant. The average composition of this mixed milk compared with human milk is as follows:

		Cow's Milk.	Human Milk.
Protein,	-	3.5 per cent.	1.7 per cent.
Fat,	-	4 „	4 „
Sugar,	-	4.5 „	6.5 „
Salts,	-	0.75 „	0.2 „

#### Differences between Human and Cow's Milk.

These analyses show that cow's milk is richer in protein and salts and poorer in sugar, but there are other important differences.

*Human milk* contains more lactalbumen than caseinogen; it is alkaline and sterile, as it comes directly from the breast to



the child; and it curdles slowly in the stomach, forming small flocculent curds easy to digest.

*Cow's milk* has twice as much protein; it contains about five times as much caseinogen as lactalbumen; it is alkaline or neutral as it leaves the cow, but before it reaches the child it is acid and swarming with germs, the variety and number of which depend on the care or otherwise with which the milk is handled; and it curdles at once in the stomach, forming a coarse curd difficult to digest.

#### **Alteration in Composition Necessary to Render Cow's Milk Suitable for the Infant.**

The composition of cow's milk must be altered to conform as nearly as possible to that of human milk, the degree of alteration varying with the age of the infant. The milk must be specially diluted to reduce the excess of protein, which is the most difficult part to digest, but in so doing both the fat and sugar become deficient, so both of these must be added to make up the loss according to the amount of dilution.

For purposes of dilution boiled or barley water are used, the latter having the advantage of making the curd less dense, and where it is desirable to retard the coagulation of the albumen one or two grains of citrate of soda are added to each feed. Albulactin added to the milk supplies lactalbumen, and causes the formation of a fine curd, which digests nearly as rapidly as human milk.

If it is desired to correct the acidity of the milk, human milk being alkaline, a teaspoonful of lime water or a pinch of sodium bicarbonate should be added to each bottle.

The *following tables* are useful as a guide as to the quantity of food required for each meal, and the alteration in composition necessary for the various months of infancy, as also the intervals between the feedings, but they must be regarded only as *approximate*, as one child will take more at a meal and digest the milk better than another child can do.

The power of digestion is judged by watching the faeces and noting their consistency, and the presence or absence of undigested curd. This gives an indication as to whether the milk or the cream or both are to be reduced or increased. If the curd is difficult to digest, albulactin should be added. The milk should be warmed to 98° F. before giving it to the child,

the intervals should be the same as for breast feeding, and care should be taken not to overfeed. When albulactin is used the required quantity is added to the diluted milk in the feeding bottle and shaken till dissolved.

## TABLES.

During First Week.	Second to Tenth Week.	Third and Fourth Months.
Milk, 1 part.	Milk, 1 part.	Milk, 1 part.
Cream, $\frac{1}{2}$ part.	Cream, dessert-spoonful.	Cream, tablespoonful.
Sugar, 10 grains.	Sugar, 15 grains.	Sugar, 15 grains.
Diluent, $2\frac{1}{2}$ parts.	Diluent, 2 parts.	Diluent, 1 part.
Albulactin, 5 grains.	Albulactin, 5 to 10 grs.	Albulactin, 15 to 20 grs.
1 ounce every 2 hours.	$1\frac{1}{2}$ to 3 ounces every 2 hours.	4 to 5 ounces every 3 hours.
ifth Month.		Sixth Month.
Milk, $1\frac{1}{2}$ parts.		Milk, 2 parts.
Cream, tablespoonful.		Cream, tablespoonful.
Sugar, 15 grains.		Sugar, 20 grains.
Diluent, 1 part.		Diluent, 1 part.
Albulactin, 20 grains.		Albulactin, 20 grains.
5 or 6 ounces every 3 hours.		6 ounces every 3 hours.

After the sixth month add one ounce for each successive month, and although milk is the chief article of diet one of the malted foods may be given for one or two meals.

**Sterilization of Milk.**—Cow's milk is usually so contaminated with germs that it is safer to sterilize it to a certain extent, more especially to guard against the risk from tubercle bacilli.

The milk should, however, not be boiled, as this destroys its antiscorbutic properties and coagulates the lactalbumen which comes to the surface as scum, and is thus lost; a temperature of 160° F. is sufficient, and sterilization may be simply done by placing a glass bottle, containing the day's supply, in boiling water up to the neck in a closed vessel and boiling for ten minutes.

The bottle of milk is then rapidly cooled and kept in a cool place.

Aymard's sterilizer, in which the milk is sterilized by steam from an outer jacket, is a convenient and inexpensive apparatus. After sterilization the milk is decanted into a clean bottle or covered jug.



Special apparatus, such as Soxhlet's, are useful where expense is no object. The principle of sterilization is the same, but there are several bottles in a frame, each bottle containing one meal.

**Feeding Bottles.**—Bottles with tubes are to be absolutely condemned, as the long tube becomes foul and cannot be cleaned properly, and thus causes diarrhoea. Only permit a boat-shape bottle to be used, open at both ends, and easily flushed with water for cleansing. A teat is slipped on the top before use, and the opening at the bottom closed with a valved rubber cork.

Two bottles with spare teats are required, these being used time about. Any milk left in the bottle after feeding should be thrown away, the bottle at once thoroughly cleaned and kept for future use soaking in clean cold water. The teats should be removed, washed, turned inside out to clean the inside, and preserved in boric lotion, which is washed off when the teat is to be used again.

If cow's milk apparently does not agree with the child, an effort should be made to alter the composition so as to make it more suitable before refuge is sought in one of the numerous substitutes. Also make sure that the proper directions are being conscientiously carried out, and that the child is being fed regularly. Carelessness in details is more often responsible for the milk disagreeing than the milk itself.

**Symptoms of Indigestion.**—In spite of all care, cow's milk may not agree, shown by symptoms of indigestion. These are greedy appetite; flatulence and colic causing the child to fret, cry, pull up its legs in pain, and start in its sleep; vomiting of curdy, sour-smelling lumps after meals; green and offensive stools containing undigested curd; and diarrhoea.

It may then be necessary to resort to some substitute for cow's milk for a longer or shorter period, such as malted milk, peptonized milk, albulactin, condensed milk, or malted foods such as Allenbury's Nos. 1, 2, and 3 food, Mellin's, etc. As the subject is an important, as well as a large one, the reader is referred to the chapters on infant feeding in the text-books on "Diseases of Children."

## PART VI.

### PATHOLOGY OF LABOUR.

#### I. Anomalies of the Expellant Powers.

(1) Precipitate labour. (2) Inertia uteri. (3) Tonic contraction of uterus.

##### 1. Excessive—Precipitate Labour.

*Definition.*—Too rapid expulsion of the foetus, endangering the maternal soft parts or the life of the child.

*Cause.*—1. *Powers*—Abnormally strong uterine and abdominal contractions, or rapidly recurring or prolonged strong pains.

2. *Passages.*—(a) Abnormal size or dilatibility of maternal passages; (b) abnormally slight degree of resistance offered by soft parts.

3. *Passengers.*—Small size or unusual compressibility of foetus—macerated foetus.

*Result.*—It may have no serious consequences for either mother or child. But there may be dangers to both.

*Dangers to Mother.*—1. The birth is so rapid that she is unable to secure proper attention.

2. Rapid recurrence of pains, especially in the presence of obstruction, *e.g.* deformed pelvis, may quickly produce a dangerous retraction of the uterus, ending in its rupture (rare).

3. Rapidly-recurring strong pains may end in inertia uteri, with the risk of post-partum haemorrhage.

4. Rapid escape of the head may cause tears of the vagina or severe laceration of the perineum.

*Dangers to Child.*—1. Absence of sufficient intermission of the pains, and consequent too frequent interference with the placental circulation, may cause asphyxia.



2. Continued pressure on the head while in the pelvis may cause intra-cranial haemorrhage, or severe pressure on the body may injure internal organs.

3. The child may fall on the floor if the mother is taken unawares, or the cord may be torn through.

*Treatment.*—Carefully watch the patient, and, if necessary, control the pains with chloroform. During the second stage give chloroform to prevent “bearing down,” and control the advance of the head at the outlet to save the perineum.

## 2. Inertia or Atony of Uterus.

*Definition.*—The uterine contractions are weak and of short duration; the intervals may also be too prolonged. As a result the pains are ineffectual, and the progress of labour is greatly delayed.

*Prognosis and Dangers.*—*First stage.*—There is no direct danger to mother or child as long as the membranes remain intact; but if the membranes rupture too early and the presenting part is not engaged, the liquor amnii can all escape. The foetus may thus become asphyxiated and die if labour is allowed to be prolonged. The mother may also become exhausted from the anxiety of the prolonged labour and want of sleep.

*Second Stage.*—See below, under “Inertia, Second Stage.”

*Third Stage.*—See “Retained Placenta.”

*Varieties.*—(a) *Primary.*—The contractions or pains are ineffectual from the beginning of labour.

(b) *Secondary.*—The pains are at first good, but inertia sets in later, *usually* due to *exhaustion* of the uterus, so that labour may cease to progress.

### Primary Inertia (first stage).

*Cause.*—1. *Defective innervation* due to conditions which interfere with the normal excitation of the cervical ganglia which promote contractions; (a) absence of bag of membranes from abnormal adhesions or hydramnion, so that the bag cannot enter the canal to compress the cervix; (b) imperfect bag of membranes, sausage-shape, as with malpresentations; (c) the presenting part not descending to compress the cervix after premature rupture of the membranes.

2. *Faults in uterine muscle.*—(a) overstretching from twins, hydramnion, (b) numerous previous labours, (c) congenital

muscular deficiency in very young or old primiparae (in the latter, more likely a rigid cervix prevents the bag of membranes acting).

*Diagnosis.*—Labour does not advance. The hand on the uterus notes the strength and duration of the pains. The patient does not feel the contractions so painful as she normally should.

*Differential Diagnosis.*—Do not mistake false pains for early labour pains nor mistake the patulous cervical canal of a multipara for a dilating cervix. Atonic pains are rarely so weak and without result as pregnancy pains. The secretion and show will be more marked in true labour.

*Prognosis* as above.

*Treatment.*—Avoid frequent and useless vaginal examinations, which are dangerous. Encourage the patient, and maintain her strength with frequent small quantities of milk, soup, meat juice, gruel, eggs. First try simple means, *e.g.* walking about; lying on the back if in bed. Empty the bowel by castor oil and enema. Keep the bladder empty. Try a hot full bath, or failing this the application of hot compresses over the abdomen. Quinine sulph. gr. v repeated every two hours for three doses, but this drug only acts in some cases. A hot vaginal douche of sterile water (100° to 110° F.), but if not effectual do not repeat. If pains are excited by a douche it can be repeated in two or three hours.

If the membranes are unduly adherent, sweep the finger round during a pain, and separate them. In hydramnios puncture the membranes high up.

If the membranes are ruptured, try expression over the fundus uteri to force the head against the cervix. If danger to mother or child arise, the cervix must be artificially dilated. The use of a hydrostatic rubber bag both dilates the cervix and stimulates uterine contractions.

### Secondary Inertia (first stage).

*Cause.*—A. *Faulty innervation*: (a) *anatomical*, excessive distension from previous labours; former caesarean section; extensive cicatrization of cervix; (b) *functional*, undue compression of lower uterine segment between head and pelvis, causing a venous stasis, which inhibits the reflex excitation of the nerve centres.



B. (1) *Exhaustion of the uterine muscle is the commonest cause* from efforts to overcome resistance of cervix, *e.g.* cicatricial stenosis, rigid cervix in elderly primiparae, cancer or fibroid. (2) The pauses between the pains are too short to allow the uterus to recover, so an exhaustion atony sets in.

C. *Indirect.*—Psychical, *e.g.* anxiety, excitement, or feeling the pains too excessively, may inhibit the pains for hours.

*Diagnosis.*—The pains, at first good, become weak, or cease.

*Prognosis* as above.

*Treatment.*—Opium, morphia. Encourage the patient and maintain her strength by good nourishment (see also “Treatment of Rigid Cervix”).

### Primary Inertia (second stage).

*Cause.*—The same conditions which cause primary inertia in the first stage may last into the second stage.

*Prognosis.*—1. If down-bearing is effective, and if the passages are easily dilatable and the resistance of the soft parts is not great, as may be the case with multiparae, the second stage may not be much delayed, even if primary inertia of the uterus is present.

2. If down-bearing is not effective, the labour may cease to progress. The prolonged pressure of the foetal head on one particular part while in the vagina may thus lead to crushing and injury to the maternal tissues.

*Treatment.*—Encourage the patient, and maintain her strength. If quinine has not been tried in the first stage, it may be given now.

If this stage is becoming too protracted, try expression; but if this cause too much discomfort to the patient or fail, then apply forceps. If forceps are applied, deliver *slowly* and with great care, so as not to empty the uterus too quickly—a danger to be avoided owing to the risk of haemorrhage in the third stage or post-partum.

Just as the head is about to be born an injection of ergot may be given into the nates to avert the risk of inertia in the third stage and post-partum.

### Secondary Inertia (second stage).

*Cause.*—Secondary inertia may have begun in the first stage from the causes mentioned above, or it may arise during

the second stage from *exhaustion* of the uterus in trying to overcome resistance due to a deformed pelvis, rigid soft parts, or a large head.

*Prognosis.*—The mother will be exhausted from her previous efforts in trying to overcome the resistance, and, as she is no longer able to bear down, the labour may come to a complete standstill.

*Treatment.*—On *no* account use forceps during the period of inertia, owing to the very grave risk of post-partum haemorrhage. Give the patient a dose of opium or morphine, and wait till the exhaustion is recovered from. After a sufficient rest the pains will return, when forceps may be used with the same precautions as for primary inertia.

### Inertia (third stage).

If atony continue after the delivery of the child, there is great risk of haemorrhage during the third stage, and post-partum (see "Complex Labour," pp. 255 and 258).

### 3. Tonic Contraction of the Uterus.

This may be partial or complete.

*Definition.*—The uterine contractions are increased in strength and duration, and the intervals are greatly shortened, but in complete tetany there is no interval for long periods.

**Partial.**—1. *Clonic Contractions.*—This occurs chiefly in the first stage. Contractions occur at too short intervals, and only affect the upper uterine segment. It is not dangerous to the child. It leads to delay and to exhaustion from greater pain, and may, therefore, end in secondary inertia.

2. *Stricture Uteri.*—Spasm of os internum (circular fibres). It occurs after escape of the liquor amnii, and may lead to rupture of the uterus owing to over-stretching of the lower uterine segment. .

3. *Trismus Uteri.*—Spasm of os externum. It delays the first stage. The cervix may suddenly tear, but if it does not yield it may lead to rupture of the uterus.

**Complete.**—4. *Tetanic Contraction.*—This arises usually from obstructed labour after the liquor amnii has all, or almost all, escaped. It may occur during the first or second stage. It affects the *whole* uterus, and the contractions are continuous, there being no intervals for long periods. It interferes with the



progress of labour, and involves most serious risks to both mother and child. If it lasts long it leads to infection during labour. Attempts at delivery when the uterus is in a state of tonic contraction either fail or lead to serious lacerations, or even rupture of the uterus. Without exception the child's life is endangered by asphyxia from prolonged interference with the placental circulation.

**Cause.**—1. Giving ergot.

2. Too frequent examinations.

3. Premature rupture of membranes.

4. Attempts to dilate cervix.

5. It most commonly arises when, after rupture of the membranes, there is obstruction to labour, as from deformed pelvis or transverse presentation.

Clonic pains may occur in neurotic and hysterical women in the first stage.

**Symptoms and Diagnosis.**—1. *Clonic Contractions.*—The pains rapidly recur. The hand placed on the uterus notes the frequency and duration of the pains and the length of the intervals. The patient gets little rest from the shortness of the intervals.

2. *Stricture Uteri.*—You may be able to note a constricting band on the uterus just above the symphysis pubis. By vaginal examination you feel a constricting band in the region of the os internum, and cannot pass the hand between this band and the presenting part.

3. *Trismus Uteri.*—Per vaginam you feel the os externum thin, hard and sharp, both during and between the pains, and the part is tender to touch. The patient is restless and complains of severe bearing-down pain.

*Diagnose* the condition from rigid cervix by the difference of feel *during* from the feel *between* the pains as against *continuous spasm* in trismus.

4. *Tetanic Contraction.*—There is severe and continuous uterine pain and the patient becomes restless, the temperature rises, and the pulse gets rapid. The whole uterus feels rigid, hard, convex in outline, and tender to touch, so you cannot palpate the foetus. *Per Vaginam.*—The presenting part is *immovable*, and covered with a large caput succedaneum. The vagina becomes hot, dry and tender. *Differential diagnosis* from a uterus which, after escape of liquor amnii, has retracted on the foetus.—The

uterus takes the form of the foetus, and you can pass the hand into the lower uterine segment, as the presenting part is movable.

**Treatment.**—1. *Clonic Pains.*—Prophylaxis. In neurotic women avoid vaginal examinations, so as to avoid exciting pains. Place her on her side in bed, which diminishes the pressure of the presenting part on the cervix. In slight cases give a warm full bath for a half to one hour. Keep the bladder and rectum empty. Opium or morphia are good for quietening the patient and regulating the pains.

2. *Trismus Uteri.*—This often yields by giving hot vaginal douches. If this does not succeed, or if there are indications for ending the labour, cut through the circular fibres round the os externum with scissors.

3. *Tetanus Uteri and Stricture Uteri.*—No attempts must be made to deliver by forceps, version or craniotomy, until the uterus is again relaxed, as otherwise the spasm is only increased, and the uterus will be ruptured. Give morphia gr.  $\frac{1}{3}$ - $\frac{1}{2}$  hypodermically, then deeply chloroform. Wait till the uterus relaxes, then deliver by forceps, craniotomy, or other operative procedure, according to the nature of the obstruction.

## II. Conditions causing Delay in the First Stage.

### A. FAULTS IN THE POWER, *i.e.* UTERUS.

1. Inertia, primary and secondary (see p. 176).
2. Tonic contraction (see p. 179).

### B. FAULTS IN THE PASSAGES, *i.e.* LOWER UTERINE SEGMENT AND CERVIX.

#### 1. Rigid Cervix.

*Varieties.*—A. *Functional.*—(a) Constitutional, simple or anatomical; (b) spasmodic.

B. *Organic.*—(a) Inflammatory; (b) new growths—fibroid—cancer.

(a) *Simple or Constitutional.*—*Cause.*—(1) elderly primipara; (2) may occur in premature labour; (3) hypertrophy of cervix. *Diagnosis.*—The pains are good, but the os does not dilate. The os is regular and circular, but thin, firm, hard, unyielding,



dry and sharp. It is lax between the pains. *Treatment*.—Chloral gr. xv and in two hours gr. x, or opium gr. j repeated. Hot vaginal douches. If these fail, give chloroform and dilate with fingers, rubber bags, or metal dilator (Bossi's). If all fail, make incisions of the cervix with scissors (see "Obstetric Operations").

(b) *Inflammatory*.—*Cause*.—(1) Previous lacerations or endocervicitis in multiparae make the cervix tough and fibrous from cicatrices; (2) previous amputation of cervix. *Diagnosis*.—The os is firm, thick, irregular, dry, hard, unyielding. It is lax between the pains. *Treatment* as under (a).

(c) *Spasmodic*.—*Stricture* and *trismus uteri* rare (see p. 179).

(d) *Organic*.—*Fibroids* (see p. 187).

**Carcinoma cervicis**.—If the growth is extensive and has spread to involve the surrounding parametrium, dilatation of the cervix may be impossible.

If dilatation is possible the friable tissues will tear during dilatation, leading to copious haemorrhage.

**Treatment**.—*Case operable*.—Perform caesarean section, followed by the radical operation of total hysterectomy.

*Case inoperable*.—The child is the first consideration. If the cervix can dilate sufficiently to permit the birth of a living child, leave the birth to nature, and, if necessary, curette away the friable masses and incise the cervix to aid dilatation.

If sufficient dilatation is impossible, perform caesarean section, followed by a subtotal hysterectomy.

## 2. Atresia or Occlusion of Cervix.

*Cause*.—(a) Simple glueing of the lips and easily separable; (b) adhesion and obliteration of the canal from previous laceration, application of caustics, or operations such as amputation; (c) unknown cause. *Diagnosis*.—No opening is seen nor felt. *Prognosis*.—The uterus may rupture if the cervix does not yield and dilate. *Treatment*.—If an indentation is seen, push through a sound and dilate. Otherwise incise transversely and dilate.

## 3. Oblique Position of Uterus and Cervix.

*Cause*.—Pendulous belly in multiparae. The uterus is so much anteverted that it cannot act in the pelvic axis. *Treatment*.—Place the patient on her back in bed and apply a

tight binder. If a pendulous abdomen occurs in a primipara, look for a deformed pelvis.

#### 4. Posterior Sacculation of Uterus.

*Cause.*—See retroflexion of the gravid uterus. The foetal head lies in a pouch behind and below the cervix, which is sharply bent and so drawn up that it cannot dilate. *Treatment.*—Manual dilatation. If this is impossible, perform caesarean section.

#### 5. Anterior Sacculation of Uterus.

*Cause.*—Previous vagino- or ventro-fixation of the uterus may so fix the anterior part of the uterus that the posterior wall grows upwards. This causes an anterior succulation, in which the presenting part lies. The cervix is high up and backwards against the sacrum and cannot dilate.

*Treatment.*—Vaginal or abdominal caesarean section is necessary.

#### 6. Wedging of Anterior Cervical Lip between Head and Pelvis.

The anterior lip becomes swollen and oedematous, and is pushed down in front of the head. It may occur independently, but more usually forms in a multipara, with a pendulous belly and anteverted uterus. *Diagnosis.*—Feel the swollen lip in front of the head, and do not mistake it for the bag of membranes, a caput succedaneum or a cystocele. Draw off the urine and note the relation of the swelling. If the finger is swept round the os, it is felt to be a part of the anterior lip. The finger *within* the os will sweep round the bag of membranes or a caput succedaneum. A cystocele is in the anterior part of the vaginal wall and lies *below* the cervix. *Treatment.*—Push the swelling up during the intervals between the pains, and keep it there till the head engages.

### C. FAULTS IN PASSENGER, *i.e.* BAG OF MEMBRANES WITH FOREWATERS.

#### 1. Hydramnios.

For diagnosis see p. 95. Owing to the great distension of the uterus a bag of membranes cannot form, and is thus a cause of inertia. *Treatment.*—Puncture the membranes high up to



let the liquor amnii slowly drain away. After the liquor amnii escapes, examine at once to note the presentation, as malpresentation is frequent, also to make sure that the cord has not been washed down.

## 2. Extra Toughness and Adhesion of Membranes to Lower Uterine Segment.

The membranes are too adherent to be separated from the lower uterine segment, thus a bag of membranes cannot form to dilate the uterus, and this leads to inertia.

*Treatment.*—Sweep the finger round and separate them to let a bag of membranes form. If the membranes do not rupture when the os is fully dilated, owing to extra toughness, rupture them with the finger during a pain.

## 3. Premature Rupture of Membranes or Deficiency of Liquor Amnii.

So-called “dry labour.” *Cause.*—(a) Undue thinness; (b) forcible or careless examination; (c) loss of support from malpresentation or deformed pelvis; (d) deficiency of liquor amnii. *Diagnosis.*—No bag of membranes is felt during a pain. *Prognosis.*—The head is a less efficient and more painful wedge, so dilatation is slow, and it may lead to inertia. *Treatment.*—If the mother show signs of exhaustion, or the foetal heart become slowed, or the cervix become oedematous, or if meconium escape—a danger signal in head presentation, showing undue compression of the foetus—then manually dilate the cervix.

# III. Conditions causing Delay in Second Stage.

## A. FAULTS IN POWERS, *i.e.* UTERUS AND ACCESSORY POWERS.

### 1. Inefficiency or Atony of Accessory Powers.

It may be primary, secondary, or indirect. (a) *Primary.*—(1) Injury to nerves from extra-median laparotomy; (2) over-stretched and flabby muscle from pendulous belly, repeated labours, or over-distension.

(b) *Secondary.*—Exhaustion from premature or prolonged efforts at bearing down.

(c) *Indirect.*—(1) Fat abdomen; (2) over-distension from

cystoma, full bladder, or intestinal distension; (3) pain or anxiety, making the patient resist the stimulus to bear down; (4) unable to bear down from general weakness, cardiac disease, phthisis.

*Treatment.*—According to the cause, apply a binder, or deliver by expression, or forceps. In cardiac disease or phthisis prevent bearing down and deliver by forceps.

## 2. Inefficiency of Uterus.

1. Atony (see p. 178).
2. Clonic or tonic contraction (see p. 179).
3. Fibroids in uterus (see p. 187).

## B. FAULTS IN PASSAGES—SOFT PARTS AND PELVIS IN THE SECOND STAGE.

1. These may be in the soft parts contained in the pelvis, viz. the bladder, the vagina and the rectum, or obstruction may arise from fibroids of the uterus, or ovarian tumours which have become incarcerated in the pelvis.

2. Delay or absolute obstruction may be caused by faults in the bony pelvis due to any of the varieties of deformed pelvis.

### 1. Bladder.

(a) *Distended Bladder.*—A cystic tumour can be seen and palpated bulging in front of the uterus just above the symphysis pubis. *Treatment.*—Pass a sterile male gum elastic catheter, and empty the bladder.

(b) *Cystocele with Prolapse of the Anterior Vaginal Wall.*—This forms a swelling, which is easily felt below the advancing head. *Treatment.*—Pass a catheter to draw off the urine, and push the swelling above the head between the pains.

(c) *Calculus.*—A stony, hard mass is felt in the bladder through the anterior vaginal wall, which is movable between the pains. A sound passed into the bladder strikes it and makes the diagnosis certain. *Treatment.*—First try and push the calculus above the pelvic brim into the fundus of the bladder. If this fail, and the stone is small, dilate the urethra and extract it. If the calculus is too large, open into the trigone of the bladder through the vaginal wall, and extract the stone. The wound is stitched as soon as labour is over.



## 2. Vagina.

(a) *Rigidity or Stenosis*.—This may be constitutional, inflammatory, or cicatricial. The conditions are easily recognized on vaginal examination. *Treatment*.—Cicatrices are cut. For rigidity try the effect of hot douches and lubricants. If these fail, chloroform and apply forceps, but extract with very great care and slowly, owing to the risk of causing severe lacerations.

If the whole vagina is stenosed, caesarean section followed by hysterectomy is necessary.

(b) *Tough Hymen*.—This fails to rupture, and may be stretched in front of the foetal head, which cannot escape. *Treatment*.—Incision.

(c) *Rigid Perineum*.—The tissues are rigid and resist distension, thus delaying escape of the head. There is great risk of laceration, and treatment should be directed to try and prevent this. Try the effect of the constant application of hot wet cloths. If a tear is threatened, chloroform, straighten the limbs, or place the patient in the hanging-leg position. If desired, a lateral or median episiotomy with scissors, to the extent of about an inch, may be done, some considering that a clean incision is better than a laceration.

(d) *Tumours*,—cysts, fibroid, cancer, abscess, haematoma, etc. Remove or open tumour as the case may be. If this fail, forceps, craniotomy, or caesarean section, as may be indicated. Open an abscess, evacuate pus, and make the part as aseptic as possible. Avoid opening or lacerating a haematoma if possible, but if it is so large as to obstruct the birth of the child, then incise it, turn out the blood-clot, and suture the wound after labour is over.

## 3. Bowel.

(a) *Distended rectum or colon* from hard faeces. The mass is felt through the posterior vaginal wall, and the condition recognized by a rectal examination. *Treatment*.—Empty the bowel by an enema, but if this fail it will be necessary to chloroform the patient and scoop out the hard faeces.

(b) *Carcinoma of Rectum*.—The tumour is felt through the posterior vaginal wall, and a diagnosis made by a rectal examination. *Treatment*.—If the tumour is small, movable, and high up, spontaneous delivery is possible, but if the tumour is large and causing obstruction, caesarean section is necessary.

(c) *Entero-ecele*.—Small intestine forms a hernia in the pouch of Douglas, forming a tumour which bulges into the vagina below the cervix. By recto-vaginal examination a gurgling mass is felt. *Treatment*.—Place the patient in the genupectoral position, and endeavour to reduce the hernia by taxis. If this fail, deliver as quickly as possible to prevent prolonged pressure on the bowel.

#### 4. Fibroids of the Uterus.

*Upper Segment of Uterus*.—Fibroids in the upper part of the uterus do not cause obstruction, but may influence the course of labour. If interstitial or submucous, they may cause delay in the first and second stages from impaired or irregular uterine action, or may cause a malpresentation of the foetus. If submucous, they may be injured during the second stage, and, becoming infected, may cause a fatal septicaemia during the puerperium.

*Lower Uterine Segment or Cervix*.—If situated anteriorly, they will rise above the pelvic brim and not cause obstruction, but if they are posterior, they become incarcerated in the pelvis below the foetal head, and completely obstruct labour.

*Treatment*.—If the tumours are above the brim and the cervix is dilated, but labour is delayed, apply forceps and deliver.

If the fibroid is in the cervix, and removal is possible, enucleate it per vaginam.

If the tumour is incarcerated in the pouch of Douglas, and removal is impossible and obstruction is great, perform caesarean section followed by myomectomy or hysterectomy, whichever is more suitable.

On no account endeavour to pull a living child past the obstruction, as crushing of the tumour may lead to necrosis and sepsis, with fatal results to the mother, while the child will be so injured that it will certainly die.

Craniotomy is only justified if the child is already dead, or where the patient is unable to get the services of an abdominal surgeon, but the obstruction must *not* be too great to prevent delivery after perforation and cephalotripsy.

#### 5. Ovarian Tumour.

The influence on labour and the treatment to be adopted depend on whether the tumour is abdominal or pelvic in position.



### Cystoma Abdominal in Position.

*Diagnosis.*—If large, two tumours—the uterus and the cyst—are felt. The tumour is more cystic than the uterus, and does not contract during a pain.

*Influence on Labour.—First Stage.*—If situated low it may delay the first stage by displacing the uterus so as to prevent it acting in its proper axis, or, more rarely, may interfere with the engagement of the presenting part.

*Second Stage.*—Over-distension of the abdomen may inhibit the use of the accessory powers.

*Third Stage and Post-partum.*—Haemorrhage is favoured if adhesions between the tumour and the uterus prevent proper retraction of the uterus.

*Prognosis.*—1. The cyst may be ruptured during labour if manipulations to aid labour are too forcible.

2. There is a special liability to torsion of the pedicle during the third stage.

3. The puerperium is especially favourable to the production of such serious complications as rupture, torsion, haemorrhage into the cyst, suppuration and peritonitis, one or other of which occur in half the cases treated expectantly.

*Treatment.*—Ovariectomy is only indicated if the tumour obstructs labour.

In all other cases leave labour to nature, aided, as may be indicated, by dilatation of the cervix, use of forceps, or separation of the placenta. If such interference is required, be careful not to rupture the cystoma.

Labour safely over, ovariectomy should be performed in the first week of the puerperium, but urgent symptoms, as from torsion of the pedicle, which may occur during or shortly after labour, demand immediate ovariectomy.

### Cystoma Pelvic in Position.

The tumour is impacted in the pouch of Douglas below the presenting part, and is a most formidable complication of labour. Dermoids are found in 25 per cent. of the cases.

*Diagnosis.*—Abdominal examination shows that the presenting part is high up, and has not engaged in the pelvic brim. Vaginal examination shows a tumour bulging into the vagina, and more or less filling the pelvis according to its size. Per

rectum the finger passes behind the tumour, and shows it is lying in the pouch of Douglas.

*Influence on Labour.*—It absolutely obstructs labour.

*Prognosis.*—The maternal mortality is about 25 per cent., due most frequently to spontaneous rupture of the cyst or improper methods of delivery.

1. The cyst may rupture and cause peritonitis, either spontaneously or due to forcible delivery.

2. Crushing of the tumour may cause suppuration and peritonitis.

3. It may be driven into the vagina or rectum, either spontaneously or due to forcible forceps delivery.

4. It completely obstructs labour, and the uterus ruptures.

5. The risks during the puerperium are the same as from a "Cystoma Abdominal in Position." (See above.)

*Treatment.*—No attempt must be made to drag the child past the tumour by forceps, version, or craniotomy.

1. *Reposition* is to be tried first. Chloroform and place the patient in the genupectoral or semi-prone position. An assistant pulls up the uterus with both hands placed over the lower uterine segment. Pass the whole hand into the vagina, and exert steady pressure to push the tumour out of the pelvis. If this fail, try pressure per rectum.

If reposition fail, or the tumour is large, make no further attempt, but operate; for the skilled surgeon, ovariectomy; for the unaided practitioner, puncture or incision per vaginam.

2. *Vaginal Puncture or Incision.*—Take thorough antiseptic precautions. If the cyst is simple, puncture with a trocar and cannula, but if the cyst is a dermoid or the contents are too thick to flow through a cannula, incise. Place the patient in the lithotomy position, expose the vagina by specula, make a two-inch incision through the posterior vaginal wall, freely incise the cyst, clear out its contents, and loosely pack the cavity with sterile gauze. The labour is then ended, aided by forceps.

Ovariectomy must be performed not later than the second day of the puerperium.

3. *Ovariectomy.*—This is performed per vaginam, or by the abdominal route; in the latter case the uterus being brought outside the abdomen, if necessary, in order to elevate the tumour. After closing the abdomen, the child is delivered per vias naturales.



4. *Caesarean Section*.—This is only indicated when ovariectomy is impossible until the uterus is empty, owing to firm impaction, dense adhesions, or intra-ligamentous position of the tumour, or when the tumour is inoperable.

### 6. Abnormal or Deformed Pelves.

Deformed pelves give rise to most serious difficulties in labour, and in certain districts, such as Glasgow, are frequently met with.

An estimation of the nature and extent of the deformity is made by measuring certain diameters of the pelvis by means of calipers—*pelvimetry*—but the results are only approximately accurate. Much depends also on the size of the foetal head, but as there are no accurate means for measuring it, the relation of its size to the pelvic brim is estimated bimanually, for, as Barbour concisely stated, “the foetal head is the best pelvimeter.”

### PELVIMETRY.

#### Measurement of External Pelvic Diameters.

*Interspinous*.—Normally measures about  $10\frac{1}{4}$  ins. Place the patient in the dorsal position, with thighs extended. Lay the points of the calipers over the anterior superior iliac spines, which are easily felt. Each point should be held between the thumb and forefinger, the tip of the forefinger being used to feel for the spines.

*Intercristal*.—Normally measures about 11 ins. Lay the points of the calipers on the outer edge of the iliac crests, and move them backwards and forwards till the widest diameter is found. This diameter is about  $2\frac{1}{2}$  ins. posterior to the interspinous. The normal difference is about  $\frac{3}{4}$  in. If the I.S. diameter is nearly as great as the I.C., look for flat pelvis; if both diameters are equally diminished, look for a generally contracted pelvis.

*External Conjugate (Baudelocque's)* (Fig. 61).—Place the patient on her side, with thighs slightly flexed, and stand behind her. Place one point of the calipers  $\frac{1}{8}$  in. below the upper border of the symphysis pubis. Place the other point at the shallow depression under the spinous process of the last lumbar vertebra. To find this spot, which corresponds with the upper

angle of the rhomboid of Michaelis, draw a line between the two dimples marking the posterior superior spines of the iliac bones. The spot lies 3-4 cms.—or about  $1\frac{1}{4}$  to 2 ins.—above the middle of this line. Crédé's method is to take it as 2-3 cms.—about 1 in.—below a line drawn through the highest

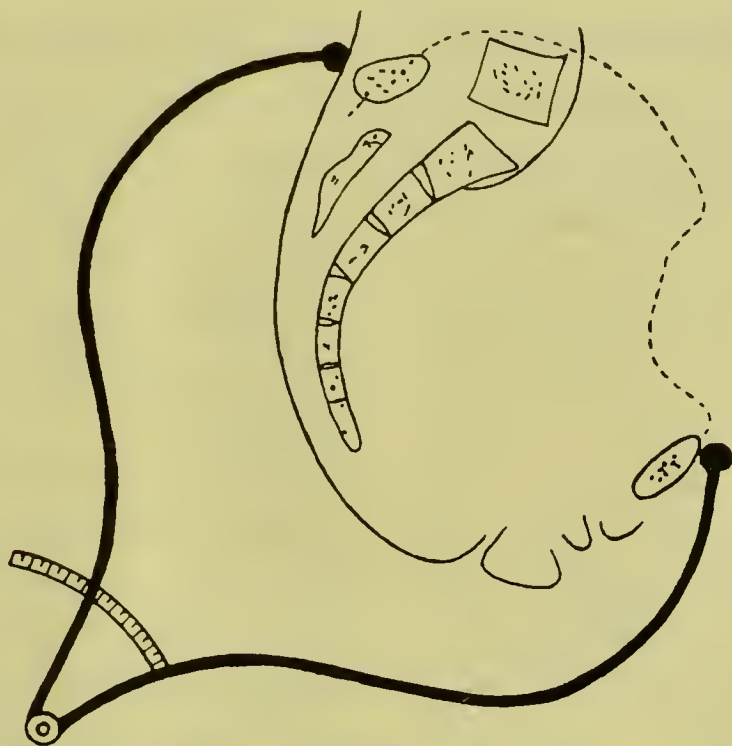





FIG. 61.—MEASURING THE EXTERNAL CONJUGATE WITH CALIPERS.

points of the iliac crests. In flat pelvis the spot is nearer the interspinous line. Confirm the position of this spot by feeling the lumbar spines, longer and more prominent, whereas the sacral spines are smaller and not easily felt. The average diameter is 8 ins. Deduct about 4 ins. to estimate the true conjugate of the brim. It is not accurate and is not reliable, but if less than  $6\frac{1}{2}$  ins. the pelvis is flat.

*Rhomboid or Lozenge of Michaelis.*—This is the space marked off by drawing lines from the last lumbar spine to the posterior superior iliac spines and along the borders of both glutei maximi muscles. A triangular figure demonstrates the condition better, the base line being formed by joining the posterior superior iliac spines. In a normal pelvis this base line is about  $3\frac{3}{4}$  or 4 ins. In a flat pelvis the base is longer, and the greater the flatness the nearer the upper angle approaches the base. In a justo-minor pelvis the base is shorter, and the triangle is nearly equilateral in shape. Normal,  ; flat,  ; justo-minor, .

*Conjugate of Outlet.*—Normally about 5 ins. Lay one point



of the calipers over the subpubic ligament and the other over the tip of the sacrum; *not* over the coccyx, as this bone is bent back by the passage of the foetal head.

*Transverse of Outlet.*—Normally about  $4\frac{1}{4}$  ins. Lay the points of the calipers over the ischial tuberosities.

#### Measurement of Internal Pelvic Diameters.

*Diagonal Conjugate.*—This is the distance from the middle of the sacral promontory to the under border of the symphysis pubis, and normally measures 5 ins. It is an important measurement, as from it the conjugata vera is calculated, and no special instrument is required.



FIG. 62.—MEASURING THE DIAGONAL CONJUGATE WITH THE FINGERS.

Place the patient in the dorsal position, and make sure that both bowel and bladder are empty. Place fore and middle fingers in the vagina, and touch the middle of the sacral promontory with the ulnar side of the tip of the second finger (Fig. 62). Mark the radial side of the forefinger where it presses against the edge of the subpubic ligament, using the nail of the

forefinger of the other hand for this purpose, then withdraw both hands together, and with tape (or, more accurately, with calipers) measure from this mark to the tip of the second finger.

In a flat pelvis do not mistake the ridge at the second sacral vertebra for the sacral promontory.

To estimate the C.V. deduct from  $\frac{1}{2}$  to  $\frac{3}{4}$  in. The higher the sacral promontory is above the symphysis pubis, the deeper and thicker the symphysis and the wider the conjugato-symphyseal angle (as occurs in flat pelvis), so much the longer is the diagonal conjugate; therefore, more should be deducted to get the true conjugate. Owing to variations in the thickness and depth of the symphysis pubis and variations in the size of the conjugato-symphyseal angle this measurement is only *approximately* accurate.

This measurement is impossible during labour if the pelvis is normal and the head is engaged in the brim; but if the head is *above* the brim, as in flat pelvis, the promontory is easily reached, since in this deformity the C.V. is narrowed.

*Conjugate and Transverse Diameters of the Brim.*—These may be measured by special calipers, such as Skutsch's, which, however, are difficult to work with accuracy. One arm is rigid and is applied to the brim internally; the other is flexible and applied outside. To measure the C.V. the distance from the sacral promontory to the top of the symphysis pubis externally is first taken. The internal arm is then applied behind the symphysis, and this measurement, representing the thickness of the bone and tissues, is deducted from the first, thus giving the C.V. diameter.

*Digital Estimate of the Size of the Brim.*—An attempt can be made to estimate the size of the brim by sweeping two fingers round it from the sacral promontory to the symphysis pubis, using the left hand for the left side and the right hand for the right side of the pelvis. If the pelvis is normal this is difficult, but if contracted is practicable.

*Measurement with Hand after Labour is Over.*—Place the fist, doubled up, in the vagina with the little finger against the sacral promontory, and extend the thumb till its tip touches the top of the symphysis pubis. Withdraw the fist and measure the distance across the hand to the thumb tip. This gives approximately the C.V.

When the abdomen is lax in the puerperium and the uterus is below the brim, the C.V. can be approximately measured by depressing the abdominal wall with the tips of the fingers of one hand down to the sacral promontory, a mark being made on the palm of the hand where it rests on the top of the symphysis pubis.

The above measurements are usually sufficient for all except the rarer forms of pelvic deformity.

*In pelvimetry for deformed pelvis* the size of the foetal head, which varies, must be taken into account, as it is the best pelvimeter. Bimanually estimate how much of the foetal head can be pushed into the pelvic brim, and to what extent it overlaps the symphysis pubis. (See "Bimanual Examination," p. 135.)



### Influence of Deformed Pelvis.

1. *On Pregnancy.*—It may cause pendulous abdomen and anteversion of the uterus, if the presenting part cannot enter the brim.

2. *On Presentation.*—The head is kept above the pelvic brim, and malpresentation is thrice as frequent. There is also a liability to prolapse of the funis or limbs.

3. *On Labour.—First Stage.*—The os dilates slowly, and there may be a finger-shape bag of membranes, which is liable to early rupture, permitting the entire escape of liquor amnii. Secondary uterine inertia may arise from a prolonged and difficult labour, or the endeavour of the uterus to overcome the obstruction may lead to uterine tetany.

*Second Stage.*—The mechanism is changed, and the labour delayed or prevented, according to the nature and extent of the deformity. Do not mistake an enlarging caput succedaneum for advance of the head.

*Prognosis.—(a) Mother.*—The prognosis is grave from

1. Exhaustion, owing to prolonged and difficult labour.
2. Oedema and necrosis of the anterior lip of the cervix, from crushing between the head and symphysis pubis.
3. Necrosis and subsequent vesico-vaginal fistula, from prolonged pressure of vagina and bladder between the head and symphysis pubis.
4. Necessity of instrumental or other operative interference.
5. Injury to pelvic articulations.
6. Increased risk of sepsis, from protracted labour and interference.
7. Rupture of the uterus in complete obstruction.

*(b) Child.*—The prognosis is grave from

1. Malpresentation.
2. Prolonged pressure following early entire escape of liquor amnii.
3. Prolapse of cord; pressure on cord or placenta.
4. Injury from pressure, *e.g.* to the head by the sacral promontory in flat pelvis.
5. Artificial delivery, *e.g.* pressure from forceps, injury during extraction after version (see under breech cases), death from craniotomy.
6. Asphyxia is the commonest cause of death of the foetus.

*Diagnosis.*—This is made

1. By noting the appearance of the patient, *e.g.* stunted growth, evidences of rickets, narrow hips, etc.
2. From the history of a previous difficult labour, if the patient is a multipara.
3. By a careful examination and pelvimetry, as above.
4. By noting the position of the head at the pelvic brim, *e.g.* it lies in the transverse of the brim in flat pelvis.
5. By feeling the head movable above the brim, although the pains are good.
6. By noting peculiarities in the mechanism of labour, *e.g.* extreme head flexion in justo-minor pelvis.

The *head above the brim*, a *pendulous belly*, or prolapse of the cord in a *primipara* at the beginning of labour, are all very suspicious of a deformed pelvis.

*Treatment.*—In the *minor degrees* of pelvic deformity with a C.V. not below  $3\frac{1}{2}$  ins. in flat pelvis, or  $3\frac{2}{3}$  ins. in generally contracted pelvis, ample time should be allowed for the foetal head to mould and for the woman to deliver herself, if possible. This *expectant treatment* gives the best results, both for mother and child. Interference by the use of forceps is only necessary when evidences of maternal or foetal distress show themselves. In *major degrees* of pelvic deformity, where pelvimetry and bimanual examination indicate the necessity for operative interference, valuable time should not be wasted in waiting for a natural delivery which is impossible, nor should fruitless attempts be made at a forceps extraction, which only increases the dangers and jeopardizes the success of necessary operative interference.

*Operations required.*—The following operations may be required. For the indications necessitating one or other of them, see the different varieties of deformed pelvis.

Forceps or Version, with a conjugate not below - - - - -	3 to $3\frac{1}{4}$ ins.
Induction of Premature Labour, with a conjugate not below - - - - -	$2\frac{7}{8}$ „ $3\frac{1}{8}$ „
Symphysiotomy or Pubiotomy, with a conjugate between - - - - -	$2\frac{3}{4}$ & $3\frac{1}{2}$ „
Craniotomy, with a conjugate between - - - - -	$2\frac{1}{4}$ „ 3 „
Caesarean section.—Absolute indication, a conjugata vera below - - - - -	$2\frac{1}{4}$ or $2\frac{1}{2}$ „



Caesarean section.—Relative indication, a  
 conjugata vera between - - - - -  $2\frac{1}{2}$  & 3 ins.

### Varieties of Deformed Pelves.

Comparison of size of pelvis and shape of brim in various deformities.



FIG. 63.—NORMAL.



FIG. 65.—FLAT.



FIG. 67.—NAEGELE'S.

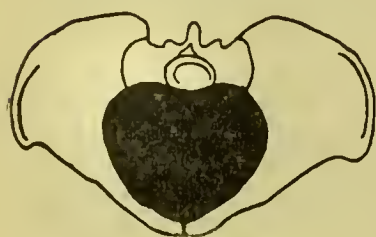


FIG. 64.—JUSTO-MINOR.



FIG. 66.—ROBERTS'.

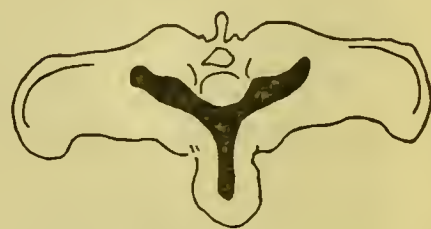


FIG. 68.—MALACOSTEON.

FIGS. 63-68.—COMPARISON OF SIZE OF PELVIS AND SHAPE OF BRIM  
 IN VARIOUS DEFORMITIES.

### Litzmann's Classification.

I. Generally contracted pelvis. Narrow pelvis without abnormality of form.

(a) Justo-minor pelvis.

II. Partially contracted pelvis. Narrow pelvis with abnormality of form.

1. Antero-posteriorly contracted pelves :

(a) Simple flat.

(b) Rickety flat.

(c) Generally contracted flat.

(d) Spondylolisthetic.

2. Transversely contracted pelves :

(a) Osteomalacic.

(b) Robert's.

(c) Kyphotic.

3. Obliquely contracted pelves :

(a) Naegele's.

4. Irregularly contracted pelves :

(a) Mostly due to bony tumours of pelvis.

**Aequabiliter Justo-Major Pelvis.**

This is a rare condition where all the diameters are equally *enlarged*, but rarely more than by about one inch. It may favour precipitate labour.

**Aequabiliter Justo-Minor Pelvis.**

This is usually called "generally contracted pelvis," or simply justo-minor pelvis (Fig. 64).

**Anatomy.**—It is a normally proportioned pelvis, but on a small scale, all the diameters being equally diminished. The C.V. rarely is less than three inches.

**Cause.**—Arrested development.

**Diagnosis.**—*Appearance.*—Patient is usually undersized and is narrow across the hips, though this may not be seen if the contraction is slight. *Vaginal examination.*—The head flexion is very marked at the brim, and the narrower the pelvis the greater the head flexion with engagement, the posterior fontanelle presenting. *Pelvimetry.*—The I.S. and I.C. diameters are both equally diminished. From the diagonal conjugate deduct  $\frac{3}{4}$  in. to estimate the C.V.

**Mechanism.**—The head engages at the brim by marked head flexion, so-called *Roederer obliquity*. Owing to the great resistance to progress and compression of head, a large caput succedaneum forms over the posterior fontanelle, while head moulding is very pronounced, the O.M. diameter being greatly elongated.

**Prognosis.**—Labour is delayed or arrested, depending on the extent of the deformity. There is risk of bruising maternal tissues and injuring pelvic joints. The child may be born dead if the pressure on the head is severe and prolonged.

**Treatment.**—Leave the case to nature as long as possible to allow of head moulding.

*Operations required.*—Forceps with a C.V. not below  $3\frac{1}{2}$  ins.

Symphysiotomy or pubiotomy with C.V. 3 ins. to  $3\frac{1}{2}$  ins.

Induction of premature labour, C.V. not below  $3\frac{1}{8}$  ins.

Craniotomy with C.V.  $2\frac{1}{2}$  ins. to  $3\frac{1}{2}$  ins.

Never perform version, as the same amount of head flexion cannot be obtained by an after-coming head, and therefore the difficulty will be greater.



## Antero-Posteriorly Contracted Pelves.

### 1. Flat Pelves.

*Varieties.*—*A.* Non-rachitic.

*B.* Rachitic or rickety.

#### *A.* NON-RACHITIC.

(*a*) Simple or non-rachitic flat pelvis.

(*b*) Generally contracted non-rachitic flat pelvis. Very rare.

**Cause.**—Faulty development. There are no signs of rickets. Many, however, regard this form as due to a slight degree of rickets, and therefore dispute the existence of non-rachitic flat pelvis.

**Anatomy.**—The bones have their normal shape, but the sacrum as a whole encroaches on the true pelvis and does not rotate with the promontory forward as in a rickety flat pelvis. All the conjugates of brim, cavity and outlet are narrowed, but the C.V. is rarely under  $3\frac{1}{4}$  ins. The transverse and oblique diameters are not much altered.

**Diagnosis.**—The build and appearance of the patient give no guide, and the condition is only recognized by noting the shortened diagonal conjugate as the cause of delayed labour if previously overlooked at the first examination.

**Mechanism and Treatment.**—As with rickety flat pelvis.

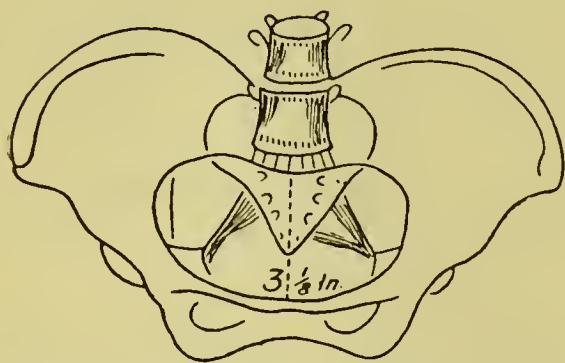


FIG. 69.—RACHITIC FLAT PELVIS, ANTERO-POSTERIORLY CONTRACTED, WITH A C.V.  $3\frac{1}{8}$  INS.

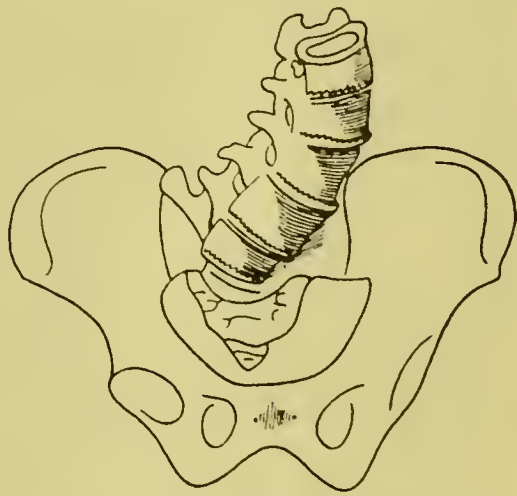


FIG. 70.—KYPHO-SOLIO-RACHITIC PELVIS.

#### *B.* RICKETY OR RACHITIC PELVES.

*Varieties.*—(*a*) Rickety flat pelvis of various degrees down to a one-inch conjugata vera at brim (Figs. 65 and 69).

(b) Generally contracted flat pelvis; rickety flattening of a justo-minor pelvis.

(c) Scolio-rachitic. Flat pelvis twisted to one side, associated with scoliosis of spine (Fig. 70).

(d) Pseudo-malacosteon. Bones crushed in as in osteomalacea, but due to prolonged rickets.

### Rickety Flat Pelvis.

**Cause.**—The softened bones due to rickets in infancy bend under the influence of the body weight, ligamentary tension and muscular contraction. The deformity is retained when the bones harden.

**Anatomy.**—*False pelvis.*—The anterior superior spines of the ilia are thrown apart so that the interspinous diameter nearly equals, equals, or is greater than the intercrystal. The iliac bones are flattened, stumpy and thickened, and the iliac crests straightened.

*True Pelvis.*—The *brim* is usually kidney shape (Fig. 65) or rarely eight shape, due to a backward projection of the symphysis pubis. The *conjugata vera* is narrow, the *transverse* lengthened, and the obliques are normal or increased. The sacrum is driven downwards and forwards, and the promontory approaches the symphysis pubis as the sacrum rotates forward, due to an increase of the angle of the plane of the brim to the horizon.

The *cavity* is roomy, all the diameters being increased. The sacrum is thrown back at its lower part and flattened, and it may be to such an extent that the upper portion is *convex forward*, causing a projection of the second sacral vertebra—the false promontory—which may be mistaken for the true promontory.

**Outlet.**—All the diameters are increased. The pubic arch is wide and the ischial tuberosities wider apart.

**Diagnosis.**—Stunted, undersized appearance of patient and various signs of rickets. The lower limbs are often very short and the hips wide. At full time pregnancy there is abnormal protuberance of the abdomen or pendulous abdomen. The fundus uteri stands high or projects well forward. The uterus, as a whole, is more movable than normal. The foetal head is not engaged, but lies above the pelvic brim and is movable.



*Pelvimetry.*—The interspinous diameter nearly equals or equals the intercrystal diameter, the iliac spines being further apart. The external conjugate measures less than  $7\frac{1}{2}$  inches.

Vaginally the sacral promontory is easily reached with the finger, and the diagonal conjugate found shortened. To estimate the C.V. deduct from  $\frac{3}{4}$  to  $\frac{7}{8}$  inch.

*Vaginal examination.*—*Presentation of foetal head.*—The head is high up and movable above the brim. The head lies with its long diameter—the occipito-frontal—in the transverse diameter of the pelvic brim; the occiput and sinciput are in the same plane, and a parietal bone presents, so-called *Naegele obliquity*. This *parietal presentation* is characteristic of flat pelvis.

During the first stage of labour the head remains movable above the brim, and the membranes rupture early.

**Positions.**—There are four positions in head presentation.

1. *Anterior Parietal Presentation* (Fig. 71).—Anterior asynclitism, (a) occiput to left, (b) occiput to right. The long diameter of the head lies in the transverse of the pelvic brim, occiput to left or right; the anterior parietal bone presents, the sagittal suture lies near the sacral promontory. This is the commoner and more favourable presentation.

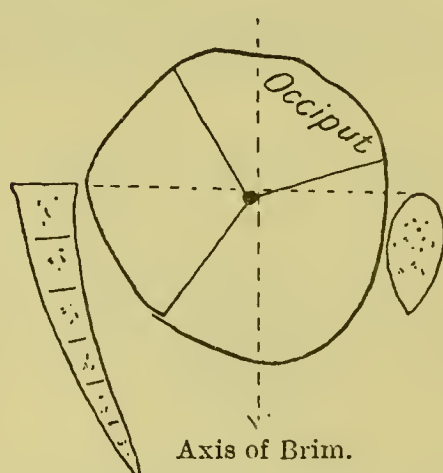


FIG. 71.—ANTERIOR PARIETAL PRESENTATION AT THE BRIM OF A FLAT PELVIS.

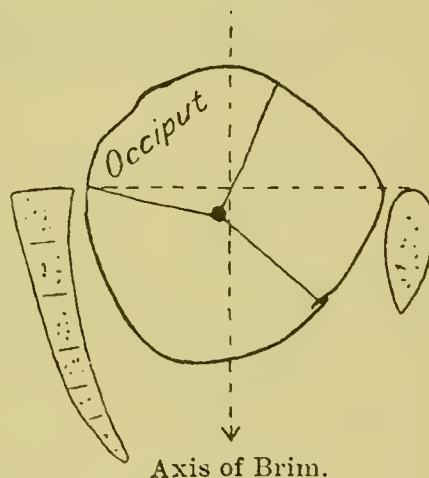


FIG. 72.—POSTERIOR PARIETAL PRESENTATION AT THE BRIM OF A FLAT PELVIS.

2. *Posterior Parietal Presentation* (Fig. 72).—Posterior asynclitism, (a) occiput to right, (b) occiput to left. The long diameter of the head lies in the transverse of the brim, the occiput to right or left; the posterior parietal bone presents, the sagittal suture lies near the symphysis pubis.

**Mechanism of Labour.**—The obstruction to labour occurs at

the pelvic brim, due to the narrow conjugate, and the head passes the brim by a mechanism peculiar to flat pelvis. If the C.V. is below  $2\frac{3}{4}$  ins. mechanism is impossible with a full-sized living child.

1. *Extension*.—The sinciput dips (*Michaelis' obliquity*).

2. The head slips to the occipital side to let the narrow bitemporal pass the narrow conjugata vera. The examining finger now notes that the bregma lies deeper in the pelvis and near the conjugate diameter, while the small fontanelle is difficult to reach or cannot be felt.

3. The parietal bone above the brim rounds the promontory in anterior parietal presentations; rounds the symphysis pubis in posterior parietal presentations. After the head passes the brim there is no further difficulty in the roomy pelvic cavity, so there is (4) internal rotation, and (5) extension and birth of the head. If extension is marked in passing the brim, the vertex may become a face case in the pelvic cavity.

(b) In generally contracted flat pelvis the head engages in the transverse, but passes the brim by extreme flexion, as in justo-minor pelvis.

(c) In very flat pelvis the head, if very small, as with a premature foetus, may pass through one lateral half of the brim by extreme flexion, so-called extra-median engagement.

**Prognosis**.—See prognosis for mother and child under "Influence of Deformed Pelves" (p. 194). In addition to these dangers to the child there may also occur:

1. A groove or depression in the frontal or parietal bone from pressure of the sacral promontory.

2. A fissure or fracture of these bones.

3. Pressure on the orbit may push out an eye.

4. A cephal-haematoma from injury may form over a parietal bone.

5. An intra-cranial haemorrhage may occur, with or without fracture, shown by symptoms of cerebral compression or irritation.

**Treatment**.—Much depends on the strength of the pains as well as the size of the head. If the pains are good, labour may end spontaneously in the slighter degrees of flatness, which would otherwise require interference, were the pains feeble.

The nature of the presentation is also of great importance, as it is much more difficult for a posterior parietal presentation



to be driven through the brim than the more favourable and more frequent anterior parietal presentation.

*Conjugate above 3 inches.*—If the C.V. is above 3 ins. leave the case to nature as long as possible, to allow of head moulding, and only interfere when indications on the part of mother or child arise.

*First Stage.*—Keep the patient in bed from the beginning of labour, so as to preserve the membranes intact as long as possible, and be specially careful not to rupture them when making a vaginal examination.

As soon as the membranes rupture examine to see if the cord or a limb has prolapsed, as these must be replaced at once, or, failing reposition, version performed.

The patient should lie on the side to which the sinciput is directed, in order to favour head extension.

*Second Stage.*—Make an examination and note whether the anterior or posterior parietal present, the head being at the brim. If the pains are good, favouring head moulding, wait and see if the head will pass the brim spontaneously.

If interference become necessary, indicated by (1) the pains being too feeble and the head remaining in the brim, (2) the mother getting exhausted or the pulse or temperature rising, (3) the child's heart slowing as a sign of threatened asphyxia, then apply forceps or perform version, and place the patient in the hanging-leg position to bring the head through the brim.

Forceps are preferable in anterior parietal presentations, as the grip of the blades favours the descent of the posterior and higher parietal bone, which has to round the promontory. In posterior parietal presentations the forceps, by their grip, interfere with the descent of the anterior and higher parietal bone, which has to round the symphysis, and readily slip off. Version is thus indicated for posterior parietal presentations unless there are contra-indications to its performance. Such arise when the membranes have been ruptured for some time, and the liquor amnii has drained away, and the uterus is retracted on the foetus. Craniotomy may then be necessary.

Version is to be preferred, whether anterior or posterior parietal presentation, if the cord or an arm or leg be prolapsed and cannot be replaced. Version is also indicated for a face presentation.

A *dead child* should be perforated before making any attempt at delivery.

*Induction of Premature Labour.*—If it has been found necessary to do a craniotomy, the question of inducing premature labour at the next pregnancy may be considered, provided the C.V. is not below  $2\frac{7}{8}$  ins.

*Symphysiotomy or Pubiotomy for a C.V.  $2\frac{3}{4}$  ins. to  $3\frac{1}{4}$  ins.*—This operation, though done in hospital, is not suitable in general practice as the mortality is high, injuries are frequent and severe, and many of the children are lost. Most of those who operate prefer not to do so with a C.V. below 3 ins., and the best results are got when it requires but little more room to get the head through.

The general practitioner who has to rely on his own resources will prefer induction of premature labour or craniotomy.

*Craniotomy for a C.V.  $2\frac{1}{4}$  ins. to 3 ins.*—If it is possible to deliver with forceps, but the child is dead, perforate. Craniotomy should not be attempted with a C.V. below  $2\frac{1}{4}$  ins. When it is possible to deliver by craniotomy, caesarean section should not be attempted in the case of a woman who has been a long time in labour, or is likely to be infected, especially by previous attempts at forceps delivery, or whose surroundings increase the dangers of a major operation.

The maternal mortality under such circumstances, or where caesarean section is performed late in the first stage of labour, is too great to justify this operation for the sake of the child alone.

*Caesarean Section.*—An absolute indication is a C.V. below  $2\frac{1}{4}$  ins. or  $2\frac{1}{2}$  ins. A relative indication is a C.V.  $2\frac{1}{4}$  ins. to 3 ins., where the mother is willing to run the risk of operation for the sake of getting a living child, although craniotomy would do, but in such cases the operation should only be done under favourable conditions, and with previous preparation as for any laparotomy.

Marked degrees of flat pelvis requiring caesarean section should be recognized, preferably during pregnancy, so that the patient may be sent to hospital, and all necessary arrangements made for operation. If not recognized till labour has set in, futile attempts should not be made to deliver by forceps, nor any further examination made, but the patient should be sent to hospital at once, for the sooner caesarean section is performed the better is the prognosis for mother and child.



### Breech Presentation in Flat Pelvis.

If the C.V. is not below 3 ins. the case should be left to nature until the trunk is born, the foetal heart being carefully watched. As the arms usually become extended above the head, be prepared to bring them down, and when this is done quickly deliver the after-coming head by one of the hand-grips or by forceps. This is greatly facilitated if an assistant at the same time expresses from above. If the breech is not descending, pull down the anterior leg. For further details, see "Obstetric Operations"; "Extraction in Breech Cases," and "Extraction of after-coming Head."

### Transverse Presentation in Flat Pelvis.

Podalic version must be performed in any case, and the labour conducted as a breech or footling presentation.

### 2. Spondylolisthetic Pelvis.

This is due to a dislocation of the last lumbar vertebra downwards and forwards into the pelvic brim, so that the lumbar part of the spine arches over the pelvis, preventing the foetal head getting into the brim (Fig. 73).

**Cause.**—(1) Congenital defect in ossification; (2) rickets; (3) tuberculosis.

**Diagnosis.**—This is easy, owing to the characteristic appearance of the patient. The lower ribs are nearer the iliac crests, so that the abdomen is shortened, the iliac crests and top of the sacrum are prominent, and the nates project. At full time pregnancy the abdomen is exceedingly protuberant, as

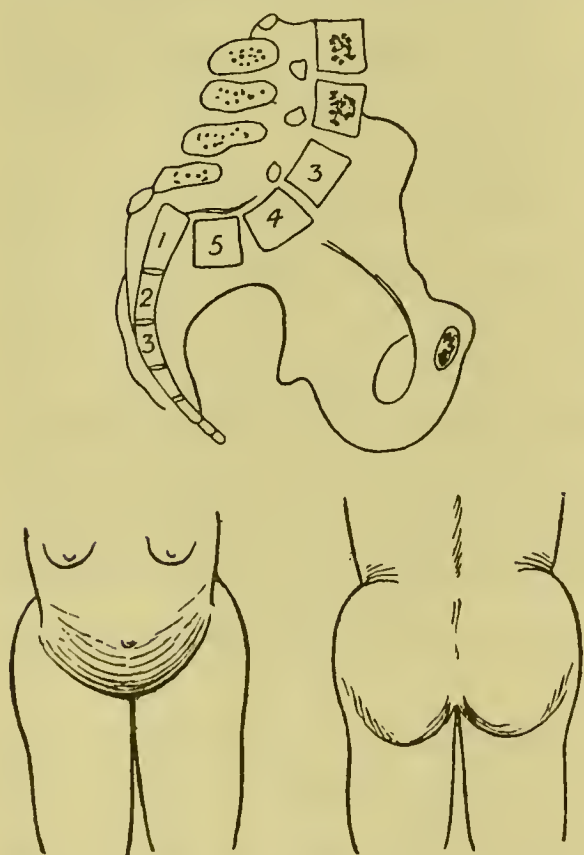


FIG. 73.—SPONDYLOLISTHETIC PELVIS.

Note the body appearance as described in the text.

the uterus is pushed well forward by the projecting lumbar vertebrae. Vaginally, the lumbar projection is felt at the

brim, and there is a marked sulcus between the sacrum and the last lumbar vertebra.

The measurement is to be made from the nearest point of the lumbar projection to the symphysis. The available conjugate may be found to be below  $2\frac{1}{2}$  ins.

**Treatment.**—Forceps, craniotomy or caesarean section, according to the length of the available conjugate.

## Transversely Contracted Pelves.

### 1. Malacosteon or Osteomalacic Pelvis.

**Synonyms.**—Compressed; rostrate; beaked; triradiate; or stellate pelvis.

**Cause.**—The deformity arises from a softening of the bones, owing to the absorption of the earthy matter and due to mollities ossium, a disease which is rare in Britain, but is commoner in Germany and Italy.

It first arises in adult life, commencing during pregnancy or the period of lactation, and is seen in half-starved women with large families and living in bad hygienic surroundings. With each successive pregnancy the disease progresses.

The bones first affected are usually those of the pelvis, and as they soften they become compressed, due to muscular action and the weight of the body.

The pelvis is thus crushed in, as it were, leading to a great alteration in its shape.

**Anatomy.**—The iliac bones are crushed in and folded on themselves. The interspinous diameter is diminished, and there is a much greater difference than normal between it and the intercrystal. The spinal column is sometimes bent over to cover the brim.

The weight of the body presses the sacral promontory into the pelvic brim, while the femora drive the acetabular regions inwards and backwards, and beak the symphysis pubis forward, thus giving the brim a characteristic stellate or Y shape (Figs. 68 and 74).

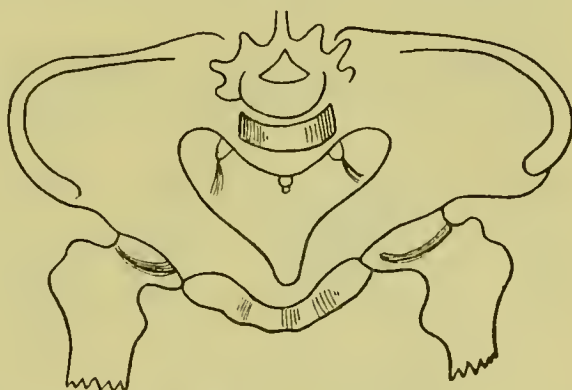


FIG. 74.—MALACOSTEON PELVIS.



The act of sitting doubles the sacrum forward on itself. The ischial tuberosities are approximated, so that the pubic arch in severe cases becomes a narrow slit. The available conjugate is greatly narrowed, and all the other diameters are very much narrowed, depending on the extent of the deformity. In marked degrees the whole pelvis is so crushed together that it is impossible for the foetus to pass.

**Diagnosis.**—There is a history of rheumatic-like pain in the pelvic bones and ribs, with tenderness to pressure of those affected. There is pain and difficulty in walking and shortening of the body.

Pelvimetry and examination of the pelvis shows the narrowing of the pubic arch, beaking forward of the symphysis pubis and narrowness of the diameters.

**Treatment.**—If not too advanced, the pelvis may yield and labour end naturally, so always see if this can be done. If not, then do caesarean section, followed by a hysterectomy, as removal of the appendages with the uterus may cure the disease. In the rickety form (pseudo-malacosteon) the bones are hard, so craniotomy or caesarean section is required, according to the degree of the deformity.

## 2. Roberts' Pelvis.

This is very rare, and but few examples exist (Figs. 66 and 75).

**Cause.**—1. Primary imperfect development of both sacral alae and ankylosis of both sacro-iliac joints.

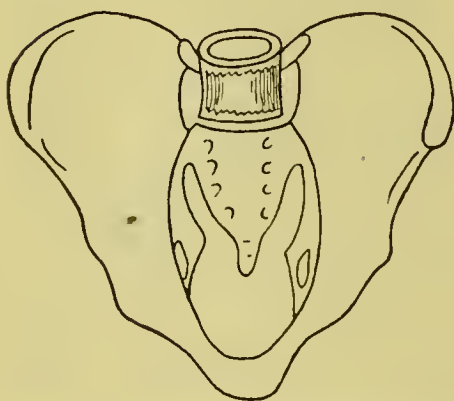


FIG. 75.—ROBERTS' PELVIS.

2. Primary caries of both sacro-iliac joints, with secondary destruction of both sacral alae.

**Anatomy.**—The sacrum is narrow, atrophied and small. The transverse diameter is much narrowed.

**Diagnosis.**—Pelvimetry, all the transverse diameters being markedly diminished.

**Treatment.**—Craniotomy or caesarean section, according to the degree of the deformity.

### 3. Kyphotic Pelvis.

The pelvis is funnel-shaped, the C.V. of the brim being lengthened, and the pelvic outlet narrow.

**Cause.**—The influence of dorso-lumbar kyphosis—hunchback—during childhood.

**Anatomy.**—*False Pelvis.*—The ilia are straightened, the arching is less, and the anterior superior spines are further apart. The posterior superior spines are nearer, owing to the narrow sacrum.

The *true pelvis* is funnel-shaped. *Brim.*—The conjugata vera is long, the transverse diameter diminished relatively and sometimes absolutely (Fig. 76). The sacral promontory stands higher and further back, and the angle of the plane of the brim to the horizon is diminished.

*Cavity.*—The conjugate is increased; the sacrum is narrowed transversely, elongated vertically, and is flatter. The lateral pelvic walls converge towards the outlet.

*Outlet.*—The transverse is contracted and the pubic arch narrow.

**Diagnosis.**—Note appearance as regards hunchback in the dorso-lumbar region.

Pelvimetry, noting especially the distance between the ischial tuberosities, where the obstruction occurs. If the measurement is taken from within, add fully  $\frac{1}{2}$  in. for the soft parts.

**Mechanism.**—The head presents in the oblique, sometimes in the transverse. Occipito-posterior cases usually malrotate. The obstruction is at the outlet, and since the occiput cannot get under the pubic arch there is great head flexion to enable the head to pass through the space bounded by the ischial tuberosities and the coccyx. In some cases there is no narrow outlet, and therefore no obstruction.

**Treatment.**—Never turn. Forceps, with a transverse not below  $3\frac{1}{4}$  ins. Below this symphysiotomy or craniotomy,

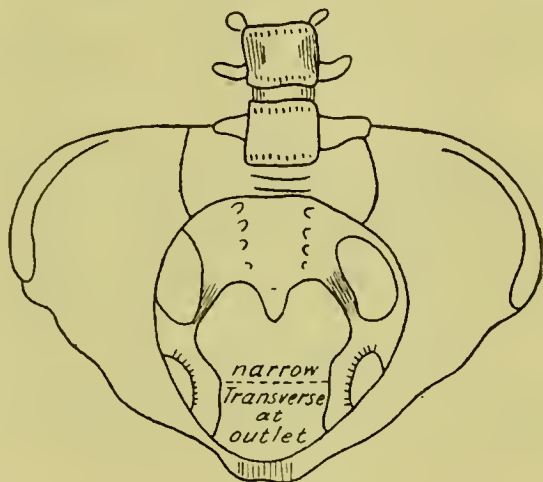


FIG. 76.—KYPHOTIC PELVIS.



according to the narrowness of the pelvic outlet. Caesarean section below  $2\frac{1}{2}$  ins.

#### 4. Infantile or Funnel-shaped Pelvis.

**Cause.**—Arrested development. The pelvis retains the same shape as in infancy, with a long conjugate at the brim. It narrows to the outlet, where the transverse is contracted and the pubic arch is narrowed.

**Treatment.**—As in kyphotic pelvis.

### Obliquely Contracted Pelves.

#### 1. Naegele Pelvis.

**Cause.**—Rare: 1. Primary imperfect development of one sacral ala and ankylosis of the sacro-iliac joint.

2. Caries of one sacro-iliac joint, with secondary destruction of the sacral ala and ankylosis.

**Anatomy** (Figs. 67, 77).—The brim is pear-shaped and twisted towards the healthy side. The ilio-pectineal line on the affected side is almost straight. The transverse is diminished, and the oblique from the healthy side narrowed. The sacrum is narrowed and slightly rotated, with its anterior surface towards the diseased side.

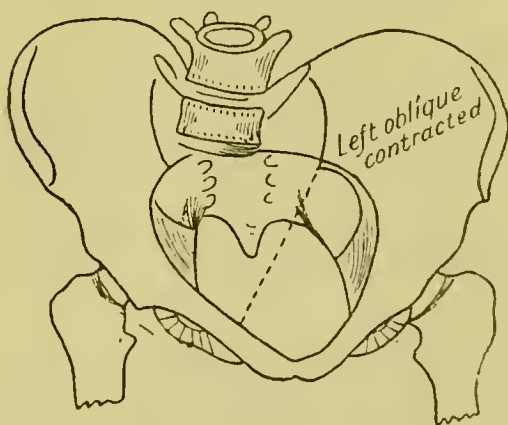


FIG. 77.—NAEGELE'S PELVIS.

**Diagnosis.**—*Pelvimetry.*—The external obliques do not correspond. The posterior superior iliac spine on the affected side

is nearer the middle of the sacrum, and the rhomboid of Michaelis is narrowed on that side.

**Treatment.**—Forceps, craniotomy, or caesarean section, according to the degree of the deformity.

#### 2. Other Forms of Obliquely Contracted Pelves.

Obliquely contracted pelves may be due to hip-joint disease, with ankylosis of the hip joint occurring in childhood, also to scoliosis of the spinal column.

### Irregularly Contracted Pelves.

These are, chiefly, pelves distorted by injury, disease, or tumours.

**Treatment.**—Forceps, craniotomy, or caesarean section, according to degree of deformity. The coccyx may be ankylosed, so that it cannot move back. If it does not yield, apply forceps.

### C. FAULTS IN THE PASSENGER—CHILD—IN THE SECOND STAGE.

#### 1. Shortness of the Cord.

(a) *Absolute Shortness.*—The cord may be very short, or even practically absent. If under six inches, it delays descent of the head.

(b) *Acquired or Accidental.*—The cord by being coiled round the neck or foetal parts leaves the free portion too short, and labour may thus be impeded. Coiling round the neck is frequently found after birth of the head.

**Dangers.**—It may impede labour, or the cord ruptures.

It may cause separation of the placenta or inversion of the uterus.

**Treatment.**—Only the second condition can be treated directly. As soon as the head is born an examination should always be made, to feel if the cord is round the neck. If so, slacken a loop and draw it over the head. If this fail, attempt to slip it back over the shoulders. If both these fail, tie a loop in two places and cut between, or, if this is difficult, simply cut the cord with scissors and deliver quickly by expression over the fundus uteri.

#### 2. Large Child and Large Head.

Delay in birth may be due to an unusually large child; it may be 12 or 14 lbs. Such an enlargement may be due to the pregnancy extending a month beyond the usual 40 weeks.

**Treatment.**—Hanging-leg posture and forceps, or symphysiotomy or pubiotomy. If the child be dead, craniotomy.

#### 3. Advanced Ossification of the Head.

The head is unable to mould, and remains too large.

**Treatment.**—Forceps, if labour is delayed.



#### 4. Swollen Dead Foetus.

The foetus is swollen from decomposition, but this is a rare cause of delay. Internal examination may be necessary to discover the cause of the delay to labour.

*Treatment.*—Puncture the swollen parts, perforate the head, and deliver with the cranioclast or cephalotribe.

#### 5. Enlargement of the Head from Disease.

##### Hydrocephalus.

**Frequency.**—It occurs in 1 in 1000 to 1 in 3000 labours (Fig. 78).

**Cause.**—The foetal skull is much enlarged and may reach the size of an adult's head, or may even be larger. The

enlargement is due to a serous effusion into the cerebral ventricles, the quantity reaching up to three pints or even more.

**Anatomy.**—The head is globular, the brow protuberant and the face small. The cranial bones are thin and parchment-like, and are separated by very wide sutures and fontanelles.

**Diagnosis.**—If the pains are good, the pelvis normal, and no obstruction can be felt per vaginam, and yet the foetal head does not engage in the brim, always look for hydrocephalus.

If the enlargement cannot be felt externally, insert the whole

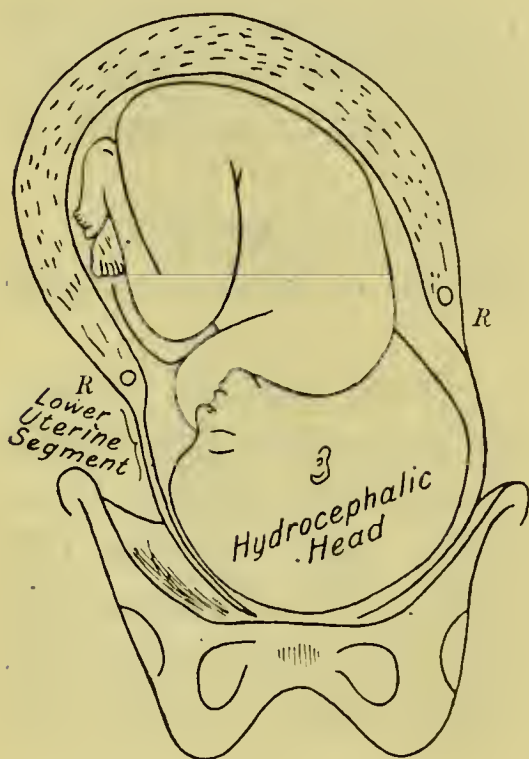


FIG. 78.—HYDROCEPHALUS.

Note the great thinning and threatened Rupture of the Lower Uterine Segment.

RR = Retraction Ring.

hand, if necessary, into the vagina to reach the foetal head, when the condition will be recognized by the large sutures and fontanelles and the parchment-like feel of the bones, which can be noted even if the sutures are narrowed by advanced ossification. Avoid being misled should a part of the head be driven down, so as to simulate the bag of membranes. *Bimanual examination* is very valuable for detecting a large head.

*Breech presentation* is about four times more frequent than with a normal-sized head. In breech cases hydrocephalus should be readily detected by noting the large head in the fundus uteri. If not recognized at first, the condition may be suspected by noticing the small shrunken condition of the limbs and trunk when born, or by the presence of spina bifida or club feet.

If, after the trunk is born, the head does not descend, the pelvis being normal, and the cause cannot be ascertained by external palpation, chloroform the patient, pass the whole hand into the uterus, and bimanually palpate the head.

**Prognosis.**—This is grave, if the condition is not recognized and treated.

1. The patient becomes exhausted.
2. Rupture of the uterus occurs in about 15 per cent. of cases.
3. Uterine inertia sets in from exhaustion, the child dies and softens, and when the pains return the head may burst and be expelled, but the patient may become infected by sepsis.
4. Risk of post-partum haemorrhage.

**Treatment.**—If *seen early*, simple puncture to evacuate the cerebral fluid may suffice, the child being born spontaneously. If desired to aid delivery after perforation, version may be performed.

If *seen late*, when labour has been prolonged and the mother is exhausted, perforate and deliver by the cranioclast. As the lower uterine segment will be thinned, version must on *no* account be performed.

In *breech cases*, perforate behind the ear or make an opening into the spinal canal as high up as possible, through which a catheter is forced up into the brain and the fluid drained off.

#### 6. Enlargement of the Body from Disease.

The body may be enlarged and delay labour from one of the following conditions :

*Hydrorachitis* (spina bifida).

*Hydrothorax*.

*Ascites*.

*Hydronephrosis*.

*Greatly distended bladder*.

*Tumours of Abdomen*.



**Diagnosis.**—If there is delay after the head is born, try and ascertain the cause by external palpation. If this fail, pass the whole hand (the patient being chloroformed) into the vagina or uterus, and note the size of the trunk and the cause of delay.

**Treatment.**—Puncture and drain fluid swellings. In other cases eviscerate.

### 7. Prolapse of Arm in Vertex Presentation.

**Cause.**—*Mother.*—Deformed pelvis; hydramnios; pendulous belly. In some cases the cause is not obvious.

*Child.*—Small head.

**Varieties.**—1. The hand or forearm is alongside the head, and is easily felt after the membranes rupture.

2. The whole arm is prolapsed and felt in advance of the head.

3. The arm lies behind the head in the nape of the neck—dorsal or nuchal displacement.

**Treatment.**—In the first two varieties chloroform the patient, pass the whole hand into the vagina, and endeavour between the pains to push the prolapsed hand or arm up past the head.

In dorsal displacement straighten the upper arm, then try and push the forearm over the head to the face.

If reduction fail, and the case is seen early enough, perform podalic version, especially for dorsal displacement or flat pelvis.

If reduction fail, and labour is too advanced to do version, place the arm where it has most room, and, if labour is delayed, apply forceps to the head.

### 8. Prolapse of Foot in Vertex Presentation.

This is rare. Do not mistake the foot for the hand.

**Treatment.**—Chloroform patient, and push up the foot during the interval between the pains. If reposition fail, or the foot lies in front of the head, perform podalic version.

### 9. Presentation of Hands and Feet Together.

This may occur in cross birth, but is very rare.

**Treatment.**—Podalic version.

### 10. Malrotated Vertex Presentation.

**Synonyms.**—Persistent or malrotated occipito-posterior position. Face to pubes case.

In R.O.P. and L.O.P. (third and fourth positions) malrotation may occur.

**Frequency.**—10 per cent. of posterior positions.

**Cause.**—1. A small head or a roomy pelvis are the commonest causes. The head having too much play, the occiput passes backwards.

2. A lax sacral segment in a multipara, failing to rotate the head forward.

3. The head, whether large or small, enters the pelvis slightly extended, and the sacral segment rotates the occiput forward.

4. Deformed pelves, kyphotic or obliquely contracted, the head being unable to rotate forward.

**Mechanism.**—See pp. 128 and 137, and Figs. 50, 51, 54, pp. 128, 129, and 131.

**Prognosis.**—Labour is delayed. There is great danger of severe rupture of the perineum, especially if the head is large or the mechanism is unfavourable, owing to extension of the head, so that it escapes in its long diameter.

**Treatment.**—Under anaesthesia an attempt may be made to rotate the occiput forward by grasping the head with the hand in the vagina, but this must only be done if the anterior shoulder is at the same time pushed round by the hand on the abdomen, *i.e.* the trunk must be rotated with the head.

Attempts may be made to promote head flexion by pushing up the brow, as this will facilitate forward rotation by the sacral segment.

If attempts at correction fail, leave the case to nature and only apply forceps if labour become unduly delayed. If forceps are used, be very careful at the outlet, owing to the great risk of severe laceration of the perineum. If rupture threaten, episiotomy may be considered.

### 11. Brow Presentation.

**Synonyms.**—Frontal or forehead presentation.

**Frequency.**—Rare. It occurs in 1 in 1750 cases.



**Definition.**—The brow presents at the brim in a normal pelvis, and the frontal suture lies in the oblique diameter of the pelvis.

**Cause.**—As in face cases, but acting in a minor degree.

**Diagnosis.**—Per vaginam, feel the bregma, frontal suture, root of nose, and adjacent parts.

**Mechanism.**—1. *Extension.*—The nose descends.

2. *Internal Rotation.*—The nose sweeps round to the front, so that the face lies behind the symphysis pubis and the vertex and occiput pass into the hollow of the sacrum.

3. *Birth of head* by flexion and extension.—The brow presents at the vulva, and is expelled as far as the nose. The

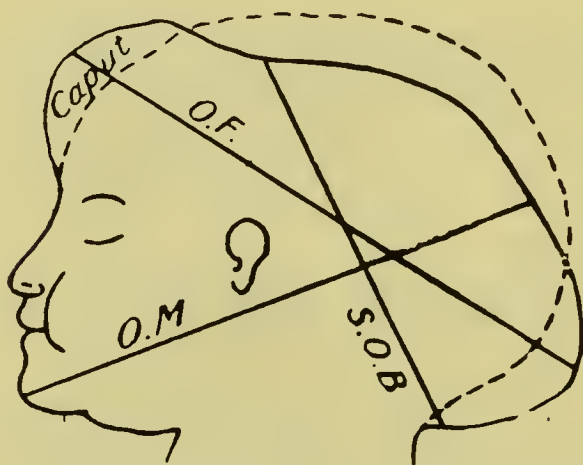


FIG. 79.—HEAD CONFIGURATION AFTER DELIVERY IN A NORMALLY ROTATED BROW CASE.

root of the nose impinges under the pubic arch, and, by a movement of *flexion*, the vertex, followed by the occiput, sweeps over the perineum. Finally, by a movement of *extension*, the nose, followed by the chin, comes out under the pubic arch, and the head is born.

*Head Moulding* (Fig. 79).

—The caput succedaneum forms on the brow, and the

vertex is flattened. The occipito-frontal and mento-frontal diameters are lengthened, the occipito-mental shortened. This moulding gives the head a triangular appearance when viewed sideways.

**Malrotation.**—Rarely a malrotation backwards occurs, the face passing into the hollow of the sacrum, the bregma lying behind the symphysis pubis. Delivery after malrotation is almost impossible with a full-time child, although it has been reported to have occurred.

**Prognosis.**—*Mother.*—There is the usual danger of a greatly delayed labour and the operative interference which is necessary unless the pelvis is roomy and the head small.

*Child.*—Very grave, as about 50 per cent. are dead born. Conversion into a face or vertex case may rarely occur.

**Treatment.**—If the case is seen early enough, try and convert the brow into an occiput by Thorn's method (see "Treatment of Face Cases," p. 222). If this fail, perform version. If seen

too late for version, leave the case to nature, and carefully watch the condition of both mother and child, and as soon as indicated, apply forceps.

If forceps delivery fail, and, in any case, if the child is dead, perforate and deliver.

*Malrotated cases*, as a rule, require craniotomy, as natural delivery is almost impossible.

## 12. Face Presentation.

**Frequency.**—1 in 250 cases.

**Definition.**—The face presents at the pelvic brim, with the fronto-mental diameter lying in the oblique diameter of the pelvis. The head is completely extended, with the occiput resting on the back, the spinal column is extended, and the thorax bulges forward (Fig. 80).

**Cause.**—(a) *Primitive.*—Rare. The head is extended before the onset of labour from—

1. Spastic contraction of the cervical muscles.
2. Elasticity of the ligamentum nuchae.
3. Goitre, hydrothorax.
4. Anencephalic foetus.
5. Dead foetus.

(b) Usually *Secondary.*—Extension occurs after the onset of labour owing to the occiput being held back while the face is driven down from—

1. Exaggerated obliquity of the uterus, as in pendulous belly.
2. Partial contraction of the lower uterine segment.
3. Flat pelvis.
4. Sometimes the cause is not obvious.

Dolicho-cephaly is the result and not the cause of face presentation, as this shape, which is found after labour is over, is due to head moulding, which disappears in a few days. Should there be a true dolicho-cephaly, as shown by the condition not disappearing, it can only be regarded as a probable contributing cause.



FIG. 80.—FACE PRESENTATION.  
FIRST POSITION, R.M.P.



**Diagnosis.**—*External Examination.*—Feel the soft irregular-shaped breech in the fundus moving with the back. The foetal small parts lie on one side, the resistant back on the other. The back is, however, not convex, but is *flat*, and recedes from the hand as you approach the head. The occiput is more easily felt as a hard rounded tumour above the pelvic brim, and separated from the foetal back by a sulcus. The cephalic eminence is therefore on the same side as the back. The foetal heart is heard loudest below the level of the umbilicus, and in mento-anterior positions it is more distinct over the front of the foetal chest, *i.e.* below the level of the umbilicus, and on the same side as the foetal small parts.

*Vaginal Examination.*—*Before the Membranes Rupture.*—The bag of membranes tend to a finger-like protrusion, and may rupture early. The presenting part is high up, and you note the absence of the hard vertex. *After the Membranes Rupture.*—When the os is sufficiently dilated, the finger first touches the region of the malar bone, and the face is distinguished by noting the orbital ridge, the root of the nose (the nostrils indicating the direction of the chin), and the mouth. The finger slips easily into the mouth and feels the gums.

**Differential Diagnosis.**—If examined when a caput succedaneum has formed, the region of the orbit and mouth being oedematous, the face may be mistaken for a breech.

#### FACE PRESENTATION.

#### BREECH PRESENTATION.

##### *External Examination.*

- |  |   |
|--|---|
| 1. Soft irregular breech in fundus.                  | 1. Hard round head in fundus.                       |
| 2. Back flat and not convex.                         | 2. Back convex.                                     |
| 3. Hard head below, with a marked cephalic eminence. | 3. Soft smaller breech below, no eminence.          |
| 4. Foetal heart loudest below level of umbilicus.    | 4. Heart loudest about or above level of umbilicus. |

##### *Vaginal Examination.*

- |  |  |
|--|--|
| 5. Mouth forms an opening on an eminence.              | 5. Anus forms an opening at bottom of the depression between nates.    |
| 6. Mouth is lax and easily admits finger to feel gums. | 6. Anus is tight from sphincter, and no gums felt.                     |
| 7. No meconium on finger.                              | 7. Meconium on finger.   |
| 8. The nose and orbital ridge are distinctive.         | 8. The coccyx, sacral tuberosities, and fold of groin are distinctive. |

### Diagnosis and Mechanism of the Four Positions.

The positions are named according to the direction of the chin or mentum.

A first vertex, L.O.A., occiput to the left anterior, becomes by complete extension of the head a first face, R.M.P., mentum or chin to the right posterior. The direction of the back to the left, and of the small parts to the right, is the same in both cases.

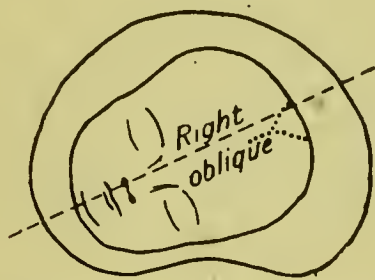


FIG. 81.—FIRST POSITION, R.M.P.

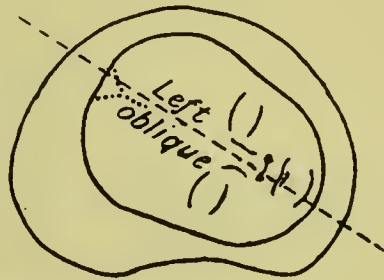


FIG. 82.—SECOND POSITION, L.M.P.

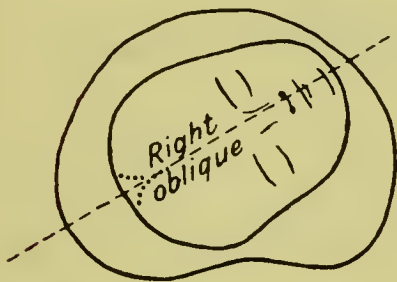


FIG. 83.—THIRD POSITION, L.M.A.

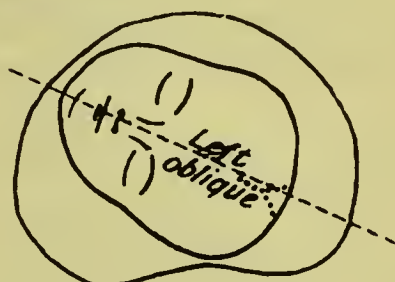


FIG. 84.—FOURTH POSITION, R.M.A.

FIGS. 81-84.—DIAGRAM OF THE FOUR FACE POSITIONS.

The Pelvic Brim is viewed from below, the patient being in the dorsal position.

**First Face Position ; R.M.P., Right Mento-Posterior ; First in Frequency** (Figs. 80, 81).—Long diameter of the face—fronto-mental—in the right oblique, chin to the right posterior, right malar presents.

**Diagnosis.**—*External.*—Breech in fundus, back to left, small parts to right, head at the brim, cephalic prominence *left* side, on same side as back. Heart loudest below umbilicus.

*Vaginal Examination.*—*Os small.*—Finger pouching of membranes, presenting part high up, absence of hard vertex. *Os dilated.*—Feel right malar; to the front and left the orbital ridge. Passing back in right oblique, feel the nose with nostrils pointing backwards, and behind this the mouth.



*Descent goes on all the time.*

1. Extension ; the chin descends.

Fig. 85<sup>2</sup>.

2. Internal rotation ; the chin makes a long rotation to the front through 3<sup>rd</sup> circle.

Fig. 85<sup>3</sup>.

1. Extension.

2. Engagement downwards and backwards.

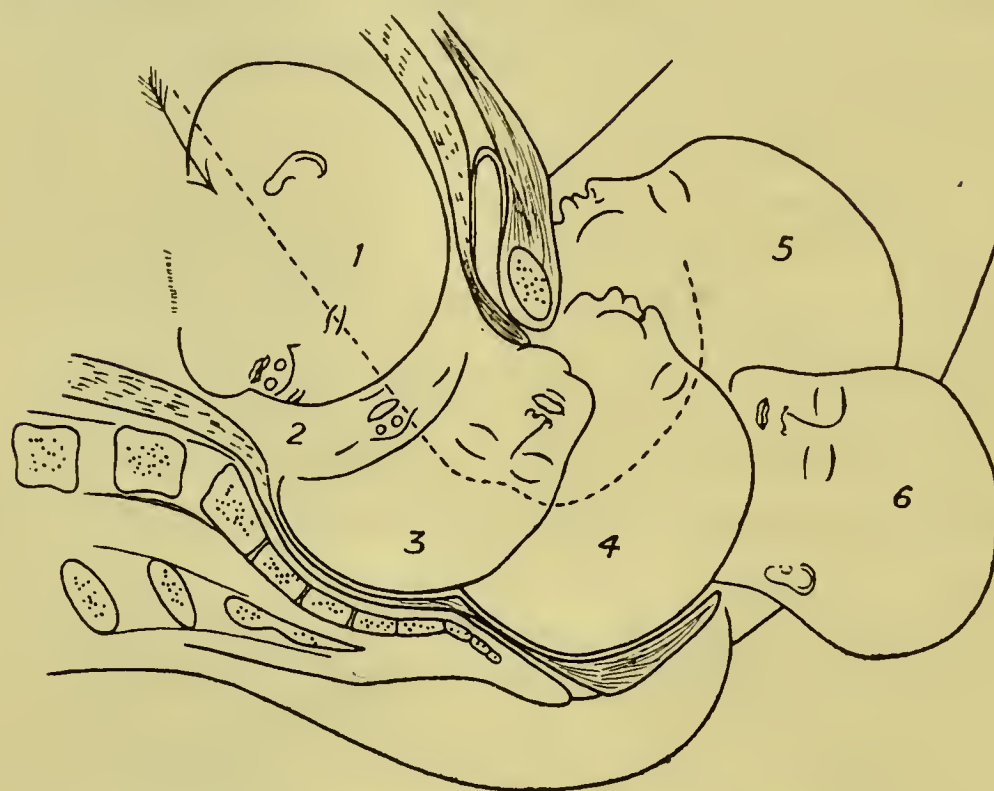


FIG. 85.—MECHANISM OF LABOUR IN R.M.P.

1. Head at onset of Labour.

2. Extension ; the chin descends.

3 and 4. Internal Rotation into the Conjugate, chin to the front.

4 and 5. Birth of the head by Flexion.

6. Restitution and External Rotation.

3. Flexion ; the chin passes under the pubic arch, and the forehead comes over the perineum followed by the occiput, and the head is born. Fig. 85<sup>4</sup>, 85<sup>5</sup>, and 86.

4. Restitution and external rotation ; the chin turns to the right or left. Fig. 85<sup>6</sup>.

3. Rotation into the fourth position, then into the conjugate.

4. Birth of the head by flexion.

5. External rotation.

**Second Face Position ; L.M.P., Left Mento-Posterior ; Third in Frequency—rare (Fig. 82).—**Long axis of the face in the left oblique, chin to the left posterior, left malar presents.

**Diagnosis.—External.**—Breech in fundus, back to right, small parts to left, head at brim, cephalic prominence right side. Heart loudest below umbilicus.

*Vaginal Examination.*—*Os small.*—As above. *Os dilated.*—Feel left malar bone, orbital ridge to right anterior, and passing back in left oblique, feel nose and mouth.

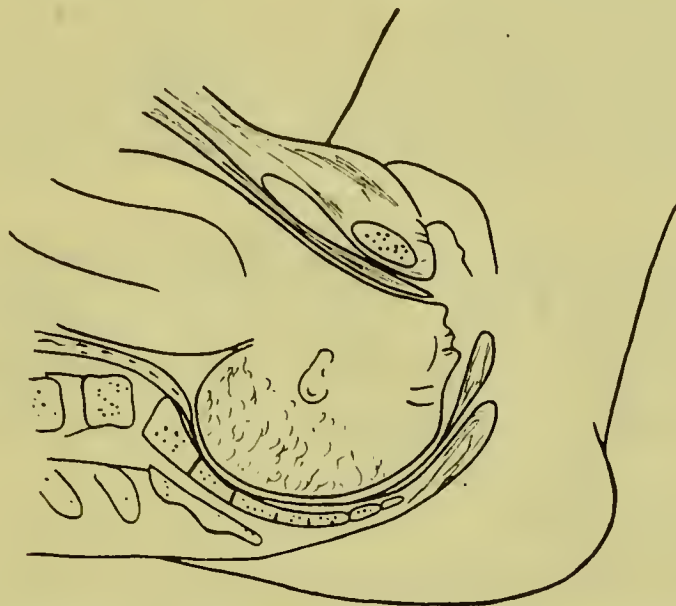


FIG. 86.—A FACE CASE NORMALLY ROTATED.

*Descent goes on all the time.*

- |  |   |
|--|---|
| 1. Extension; the chin descends.   | 1. Extension.   |
| 2. Internal rotation; the chin makes a long rotation to the front through $\frac{3}{4}$ th circle.   | 2. Engagement downwards and backwards.                        |
| 3. Flexion; the chin passes under the pubic arch, and the forehead sweeps over the perineum, followed by the vertex and occiput, and the head is born (Fig. 86). | 3. Rotation into the third position, then into the conjugate. |
| 4. Restitution and external rotation; the chin turns to the left or right.   | 4. Birth of the head by flexion.                              |
|  | 5. External rotation.   |

**Third Face; L.M.A., Left Mento-Anterior; Second in Frequency** (Fig. 83).—Long axis of the face in the right oblique, chin to the left anterior, left malar presents.

**Diagnosis.**—*External.*—As with L.M.P., but heart is loudest over thorax on *left* side.

*Vaginal Examination.*—*Os small.*—As above. *Os dilated.*—Feel left malar bone. The mouth is to the left anterior, and, passing back in the right oblique, feel the nose and orbital ridge.



*Descent goes on all the time.*

- |  |  |
|--|--|
| 1. Extension ; chin descends.  | 1. Extension.                            |
| 2. Internal rotation ; the chin makes a short rotation to the front through $\frac{1}{8}$ th circle. | 2. Engagement downwards and backwards.   |
| 3. Flexion ; as above (Fig. 86).   | 3. Internal rotation into the conjugate. |
| 4. Restitution and external rotation ; the chin turns to the left.                                   | 4. Birth of the head by flexion.         |
|  | 5. External rotation.                    |

**Fourth Face ; R.M.A., Right Mento-Anterior ; Fourth in Frequency—rare** (Fig. 84).—Long axis of the face in the left oblique, chin to the right anterior, right malar presents.

**Diagnosis.**—*External.*—As with R.M.P., but heart is loudest over thorax on *right* side.

*Vaginal Examination.*—*Os small.*—As above. *Os dilated.*—Feel right malar bone. The mouth is to the right anterior, and, passing back in the left oblique, feel the nose and orbital ridge

*Descent goes on all the time.*

- |  |  |
|--|--|
| 1. Extension ; chin descends.  | 1. Extension.                            |
| 2. Internal rotation ; the chin makes a short rotation to the front through $\frac{1}{8}$ th circle. | 2. Engagement downwards and backwards.   |
| 3. Flexion ; as above (Fig. 86).   | 3. Internal rotation into the conjugate. |
| 4. Restitution and external rotation ; the chin turns to the right.                                  | 4. Birth of the head by flexion.         |
|  | 5. External rotation.                    |

**Head Moulding and Caput Succedaneum.**—The suboccipito-bregmatic and submento-bregmatic diameters are shortened, the

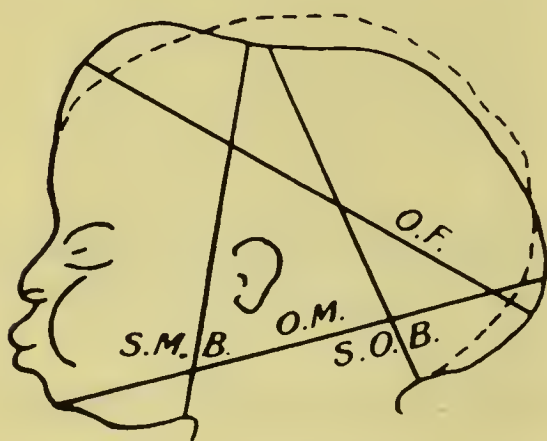


FIG. 87.—HEAD CONFIGURATION AFTER DELIVERY IN A FACE CASE.

occipito-frontal and occipito-mental diameters lengthened ; thus the vertex is flattened and the head elongated (Fig. 87). The face is much swollen and congested ; the primary caput succedaneum forms about the eye and malar bone—lying anterior ; the secondary caput about the mouth, the lips being much swollen and oedematous.

**Malrotated R.M.P. and L.M.P. ; Persistent Mento-posterior Position.**—Mechanism : (1) flexion, sinciput descends ; (2)

internal rotation, sinciput is rotated to the front, and thus the chin passes into the hollow of the sacrum (Fig. 88). *Natural expulsion* with a full-sized child is *impossible*, as extension cannot take place. If the child is sufficiently small and the pelvis



FIG. 88.—MALROTATED FACE CASE OR PERSISTENT MENTO-POSTERIOR.

Birth with a full-sized foetus is impossible.

roomy it may be driven straight out. In malrotated cases there is therefore no mechanism after internal rotation, and labour is completely arrested if the child is full sized.

**Prognosis.**—*Mother*—1. A sausage-shape bag of membranes forms which may rupture early, and as the face cannot mould, it acts as a bad dilator.

2. Exhaustion may set in from the delayed labour, and secondary inertia may occur.

3. There is a greater risk of rupture of the perineum.

4. There should be no maternal mortality if the case is properly managed.

*Child.*—From 5 per cent. to 8 per cent. are still-born from delayed labour and undue compression of head. The mortality may be much higher if the case is badly managed or ineffectual attempts are made to change the face into a vertex.

The child is very unsightly after birth from the great swelling of the face and lips and elongation of the head; but this disappears in three or four days. During this time the child may not be able to suck owing to the excessive swelling of its lips.

**Treatment.**—Expectant treatment has given the best results, and as most cases end naturally it is better to leave the birth to nature and only to interfere when indications arise in the second stage by the application of forceps.



Put the patient to bed and keep the bladder empty. The bowel should be thoroughly emptied. Avoid rupturing the membranes, as the face is a bad dilator, also avoid injuring the eyes during examination. Carefully guard against rupture of the perineum. Warn the friends that the face will be unsightly for a few days after birth.

The child may require spoon feeding for a few days till it can suck.

Version is not advisable, as the foetal mortality is greater in breech cases. Version is, however, indicated in a flat pelvis, or should the cord or an arm prolapse.

### Malrotated Face Case.

If the *chin is malrotated* or *forward rotation is delayed* you may bimanually attempt under anaesthesia to rotate the head and shoulders simultaneously, so as to make the chin come to the front, and then use forceps. In *persistent mento-posterior cases*, if attempts at correction fail, craniotomy is necessary,

unless the child is very small. Perforate through the mouth and hard palate or orbit.

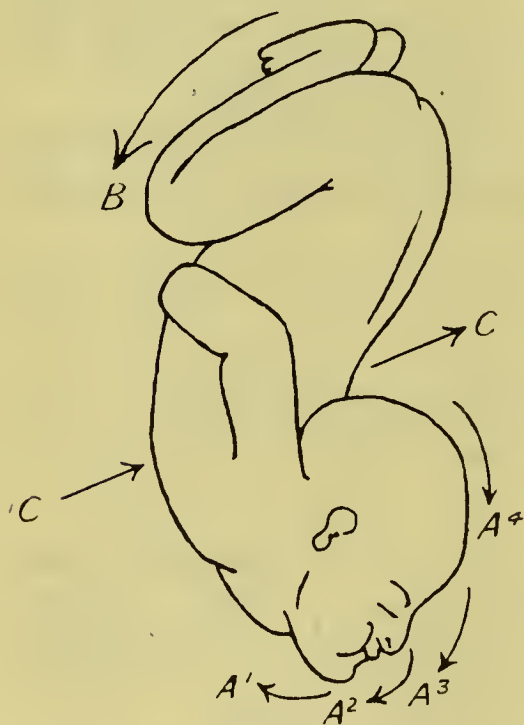


FIG. 89.—THORN'S METHOD OF CONVERTING A FACE INTO A VERTEX CASE.

Arrows A, B, C. See Text.

### Methods for Changing the Face to a Vertex.

These are not to be recommended since, as already stated, expectant treatment has given the best results. The manoeuvre involves considerable manipulation, increasing the risk of sepsis for the mother, the attempt frequently fails, and the foetal mortality is increased. The most successful method is Thorn's, so is the only one described here. Schatz's method nearly always fails.

*Thorn's Method* (Fig. 89).—It should only be attempted, if at all, in mento-posterior positions, the patient should be deeply anaesthetized, the cervix should be well dilated, and the membranes unruptured or the head mobile.

The patient lies on the side on which the chin is, the fingers in the vagina flex the head by pushing on the chin ( $\rightarrow A$ ), then the malar bones, then the forehead ( $\rightarrow A^3$ ), and lastly, the hand pulls down the occiput ( $\rightarrow A^4$ ). At the same time the outer hand pushes the bulging chest backwards ( $\rightarrow C$ ), and then pushes the breech forward ( $\rightarrow B$ ). If this fail, introduce the whole hand, dislodge the head, grasp the vertex and draw it down.

### 13. Podalic Lie, Pelvic, or Breech Presentation.

**Frequency.**—1 in 30 or 40. 1 in 62 full time labours.

**Varieties.**—1. *Complete Breech* (Fig. 90).—The child has the usual flexed attitude. The nates sink down and present with the feet alongside, as if the child were sitting cross-legs in the lower uterine segment with the thighs close to the body.

2. *Incomplete Breech*.—The nates alone present, the thighs and legs being fully extended, and the feet being up beside the head.

3. *Footling*.—There is partial extension of the limbs, so that the feet present instead of the breech.

4. *Knee (rare)*.—The thighs are extended and the legs flexed, the child rotates forward and the knees present.

**Cause.**—*Mother*.—1. Deformed pelvis.

2. Hydramnios.

3. Placenta praevia.

4. Irregularity of the uterine wall from irregular contractions or fibroid tumours.

*Child*.—1. Premature labours.

2. Twins.

3. Dead foetus.

4. Hydrocephalus.

5. Monsters.

It may occur without any obvious cause.

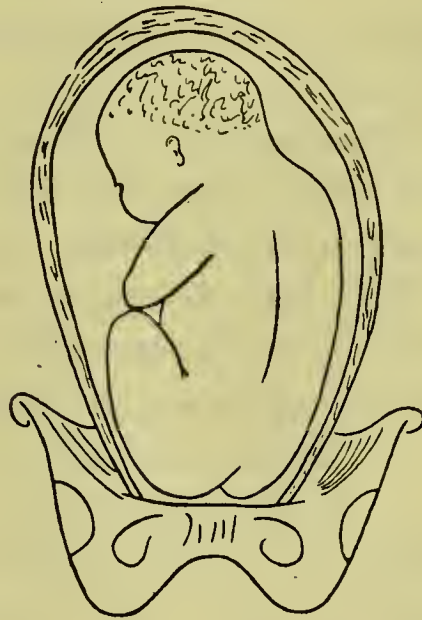


FIG. 90.—BREECH PRESENTATION.  
FIRST POSITION, L.S.A.



**Diagnosis.**—*External Examination.*—Feel the hard, smooth, round head in fundus moving independently of the back, and the soft smaller breech below. The foetal heart is loudest about or above the level of the umbilicus, and to the side where the back lies.

*Vaginal Examination.*—*Before membranes rupture* there is a finger-like pouching of the bag of membranes, which tend to rupture early. The presenting part is high up, and you note the absence of the hard head, and feel the softer breech or feet.

*After membranes rupture* the finger first palpates the soft anterior hip, then feels the ischial tuberosity, anus, coccyx, sacral tuberosities and fold between the thighs, with genitals. The anus forms an opening at the bottom of the depression between the two nates. The sphincter ani grips the finger when introduced, and on withdrawing the finger it is found stained with meconium.

**Differential Diagnosis.**—The breech may be mistaken for the face or shoulder, or later for a delayed head with a large caput owing to its softness.

The anus has also been mistaken for a rigid cervix and attempts made to dilate it, but this could only occur with a careless examination, not to say gross carelessness.

1. *Diagnosis between breech and face presentation.* See p. 216.

2. *Diagnosis between breech and shoulder, or transverse presentation.* There must be no doubt as to the correct diagnosis between these two presentations, as while a breech is left to nature, a transverse must be corrected at once, and the earlier a diagnosis is made, the better is the prognosis for mother and child.

#### BREECH PRESENTATION.

#### TRANSVERSE PRESENTATION.

##### *External Examination.*

1. Long axis of uterus corresponds with long axis of mother.

2. The fundus uteri contains the head.

3. The back is on one side, the small parts on the other.

4. The breech is felt engaged in the pelvic brim.

5. Position of foetal heart sound not reliable as a diagnostic between the two.

1. Long axis crosses that of mother, the uterus being elongated obliquely from side to side.

2. The fundus is empty.

3. The breech is on one side high up, the head is low down on the opposite side.

4. The palpating fingers get below the presenting part above the pelvic brim.

5. Not reliable.

*Vaginal Examination.*

6. Os and presenting part easier reached.

7. Fold of groin ; no ribs felt.

8. The foot won't extend, and you catch on the projecting heel when you slip the foot between two fingers. The toes are of equal length.

9. Knee. Feel the patella as a bony projection with a dimple above.

6. Os high and presenting part more difficult to reach, unless the shoulder is impacted.

7. Fold of axilla ; ribs felt.

8. The hand extends in line with the arm, and it does not catch when you slip it between two fingers. The fingers are of unequal length, and the thumb can be flexed into the palm.

9. Elbow. Feel the olecranon as a bony projection, with a dimple on each side.

If examined late in the first stage, when the liquor amnii has all escaped after early rupture of the membranes, and the uterus is moulded on the foetus, a diagnosis by external palpation is difficult, and one must rely on vaginal examination. If there is the slightest doubt about the diagnosis, chloroform the patient, introduce the hand into the vagina and pull down the nearest limb. If a leg is brought down the case is a breech, if an arm then the case is a transverse.

3. *Diagnosis of an incomplete breech.*—This is difficult to diagnose by vaginal examination alone, but by external palpation it may be possible to feel the feet near the head in the fundus uteri.

**Four Positions.**—The *bitrochanteric* diameter—4 inches—engages in one or other oblique, but the position is usually named after the position of the sacrum, which takes the place of the occiput. The *sacro-anterior* are the more frequent positions.

1st Breech.—Left sacro-anterior, L.S.A. Long axis (bitrochanteric) of breech in left oblique, left hip presenting (Fig. 90.)

2nd Breech.—Right sacro-anterior, R.S.A. Long axis (bitrochanteric) of breech in right oblique, right hip presenting.

3rd Breech.—Right sacro-posterior, R.S.P. Long axis (bitrochanteric) of breech in left oblique, right hip presenting.

4th Breech.—Left sacro-posterior, L.S.P. Long axis (bitrochanteric) of breech in right oblique, left hip presenting.

**Mechanism.**—1. *Engagement* (corresponds to flexion).—The breech comes down, and the anterior hip descends and leads.



2. *Internal Trunk Rotation into Conjugate*.—The anterior hip—left in L.S.A.—rotates to the front to lie under the pubic arch.

3. *Extension and Passage of Body*.—The anterior hip first comes out under the pubic arch, then the posterior hip sweeps over the perineum, and the breech is born, followed by the lower limbs, which drop out. Then the rest of the trunk follows, and the folded arms drop out. The bisacromial diameter—about  $4\frac{1}{2}$  inches—comes down in the same oblique, the anterior shoulder is rotated to the front and

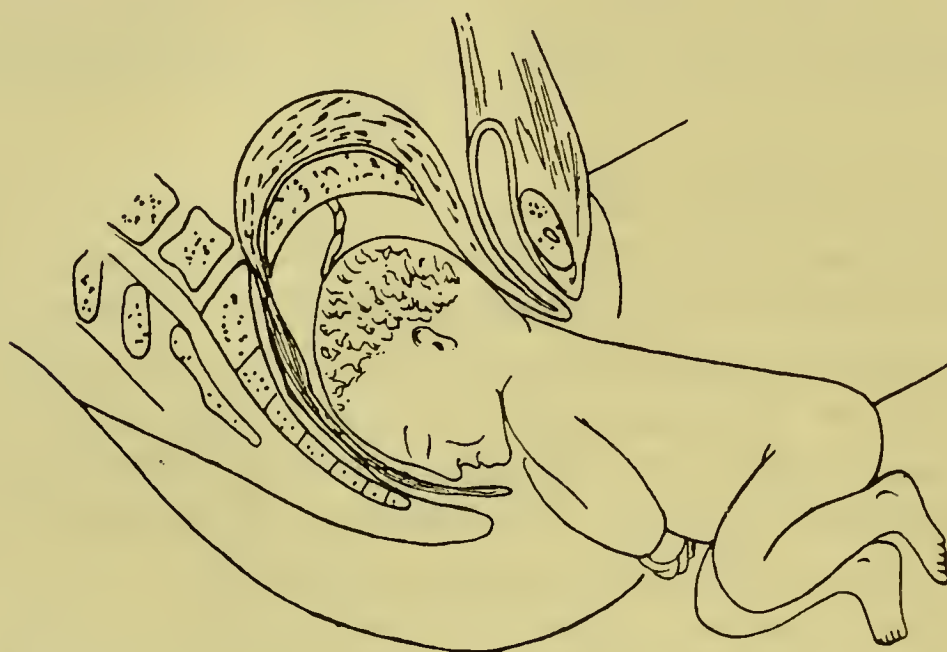


FIG. 91.—BREECH CASE WITH THE AFTER-COMING HEAD NORMALLY ROTATED.

passes under the pubic arch, then the posterior shoulder sweeps over the perineum, and the trunk is born. During the descent of the trunk the spine is lateri-flexed round the symphysis pubis. The trunk is also twisted, as while the breech is being born in the conjugate the shoulders are coming down in the oblique.

4. *Rotation of Head internally and of Body externally*.—The head, flexed, enters the pelvis in the opposite oblique (right in L.S.A.), and the occiput normally rotates to the front behind the symphysis pubis (Fig. 91). The trunk rotates with the head so that the dorsal surface looks anteriorly.

5. *Expulsion of Head* (Fig. 91).—The head flexes; the nape of the neck hitches under the pubic arch; the chin first sweeps over the perineum followed by face, then the head is born.

*Malrotation of Trunk and Head*.—The trunk may malrotate

to lie dorso-posterior, and this is specially liable to occur if the normal mechanism is disturbed by faulty traction, as where the posterior leg is brought down by mistake and pulled on, causing a long rotation to the front.

As a result, the head may malrotate with the face looking forwards, the occiput passing into the hollow of the sacrum.

*Mechanism of Birth of the Head in Malrotation.*—The nape of the neck catches on the perineum, the head flexes, and the chin, followed by the face, is driven under the pubic arch as far as the root of the nose.

The occiput now sweeps over the perineum, and the head is born.

*Marked Extension of Malrotated Head.*—A rarer condition, only possible with a small head, is marked extension, with the chin above the level of the symphysis pubis (Fig. 92). The *occiput* comes out *first* over the perineum, followed by the vertex. The *face* comes *last*.



FIG. 92.—BREECH CASE WITH THE AFTER-COMING HEAD MALROTATED AND EXTENDED.

*Caput Succedaneum.*—

This forms on the anterior hip, and if the child is a male the scrotum is greatly swollen.

**Prognosis.**—*Mother.*—1. Liable to early rupture of the membranes, which are badly supported. The breech is a less efficient dilator, so labour is delayed. All the liquor amnii may drain away, which further delays labour, and is also unfavourable for the child.

2. The labour may also be delayed after the breech is born, as the larger head must dilate the passages more than the smaller breech has done.

3. If interference is required there is increased danger to the mother:

(a) From increased risk of sepsis.

(b) Introducing the fingers or hand alongside the trunk may lacerate the passages.



(c) Too sudden delivery, for the sake of the child, may cause uterine inertia, and thus favour post-partum haemorrhage.

Avoid this risk by aiding delivery by expression rather than by traction, but, if traction is required, deliver as slowly as is safe for the child.

**Prognosis.**—*Child.*—The foetal mortality is about 10 per cent. in primiparae, 3 or 4 per cent. in multiparae; but many die within forty-eight hours after birth from injuries received during labour. Improper management, especially in the prompt delivery of the after-coming head, will greatly increase this foetal mortality.

Footling cases are more dangerous than complete breech cases, as the cervix is not so fully dilated, and therefore the head takes longer to pass the cervix. This leads not only to increased delay both for mother and child, but there is also the greater risk of the cord being compressed between the head and the dilating cervix and asphyxiating the child.

The special dangers to the child are:

1. *Prolapse of Cord.*—The cord is liable to prolapse, especially in footling cases, and is thus compressed in the first stage of labour, leading to early asphyxia.

2. *Compression of Cord.*—More or less compression is unavoidable. The cord, as it passes upwards from the umbilicus to the placenta, is liable to compression between the trunk, shoulders or head and the perineum, vagina or cervix. Complete and continuous compression for five minutes will kill the child by asphyxiation.

3. *Compression of Placenta* between head and uterus, or *premature separation of placenta* from diminution in size of uterus, causing asphyxia.

4. *Premature Attempts at Respiration.*—Sucking fluids into the trachea; and thus interfering with respiration after birth. Compression of cord, or stimulation of cold on born trunk may cause this.

5. *Injury to Sterno-Mastoid* and haematoma forms.

6. *Injury to Internal Organs* from pressure by soft parts, especially the cervix.

7. *Injury from making Traction during Delivery*, e.g. injury to spine; injury to arms while bringing them down if extended above the head; injury to mouth, eyes, or face in delivering the head by a hand grip.

8. *Injury to Nerves of Brachial Plexus* if the arms are extended above the head, thus leading to paralysis (Duchenne's) of the arm.

*Signs of Asphyxia demanding Interference and Quick Delivery.*—The child shows convulsive movements and the cord pulsations are felt slow (100 or less) and strong. As asphyxia deepens the pulsations get weak, and though at first they quicken they soon get slower and slower.

A child may be delivered and resuscitated even when the cord pulsations are no longer felt, as the heart may still be beating, though feebly.

**Treatment.**—If the case is diagnosed at the end of pregnancy, or very early in the first stage before the breech is engaged, an attempt may be made by *external* version to convert it into a vertex presentation. If this fail, or the breech is already engaged, leave the birth to nature, and on no account interfere until indications demand it. The birth can usually be left to nature until the breech is born, as it is after this that danger to the child is most likely to arise from compression of the cord. Do not tell the mother that anything is wrong, but inform the husband that the child is "coming the wrong way," and the consequent danger to its life.

*First Stage.*—As soon as the breech is diagnosed, keep the patient in bed so as to preserve the membranes intact as long as possible. For the same reason avoid any further examination vaginally. Watch the patient throughout the whole labour, and remain in the house. As soon as the membranes rupture examine again to confirm the diagnosis, and make sure that the cord has not prolapsed. From now onwards frequently auscultate the foetal heart, which will give warning of threatened asphyxia and indicate the necessity for interference on behalf of the child.

Let the breech complete the dilatation of the cervix, and on no account pull down a leg. If the legs are up the cord is better protected, and the cervix is further dilated than by a footling case.

*Second Stage.*—Leave the case to nature as long as the condition of mother and child is good. Frequently auscultate the foetal heart.

Have warm towels all ready to cover the lower limbs and trunk as soon as they are born, since cold may stimulate



premature attempts at respiration, with consequent sucking in of mucus and fluids into the larynx. Towels are also necessary to wrap round the slippery body, as interference is often necessary, such as bringing down the extended arms and quick delivery of the after-coming head.

Have a hot bath and other means at hand to resuscitate the child, which is often asphyxiated.

*Breech at Outlet.*—When the *breech presents* at the outlet, place the patient on her back in the cross, or oblique bed, position, as one can best aid delivery when required with the patient in this position.

As soon as the trunk is born as far as the navel feel the pulsations of the cord, and as long as these are satisfactory do not interfere. At this stage encourage the mother to bear down, but, should down-bearing be ineffective, assist delivery by expression on the fundus uteri.

*Never* pull on the legs or breech merely to assist delivery, as this will certainly displace the arms above the head and cause extension of the head.

If the upper part of the trunk is not promptly driven down and expression fails, and speedy delivery is now necessary, bring down the arms and deliver the head. The *important part* of the management is the *prompt delivery* of the after-coming head after the trunk is born, as the child will die if complete compression of the cord last five minutes (see “Signs of Asphyxia,” p. 229).

Deliver the head by one of the hand grips, and if this does not at once succeed do not waste time at further attempts, but apply forceps to the after-coming head.

*Method of Applying Forceps.*—Carry the child forward towards its own dorsal aspect, and apply the blades from its ventral aspect so that they lie over the cheeks, and thus flex the head during traction.

### Management of Complicated Breech Cases.

For details of management see “Obstetric Operations.”

#### *First Stage.*

1. *Premature Rupture of Membranes.*—The breech is an inefficient dilator of the cervix, so if delay occur dilate with a hydrostatic bag, *e.g.* de Ribes’.

2. *Prolapse of Cord*.—If it prolapse after replacement, bring down the anterior leg, which will plug the cervix and keep up the replaced cord.

*Second Stage.*

3. *Impaction of Breech* from deformed pelvis, rigid passages, or large child. (a) If the knees are flexed and the breech will permit, pull down the anterior or both feet.

(b) If the lower limbs are extended (incomplete breech) or breech impacted, pull down the breech by hand or by a bandage over the groins.

4. *Cord. Riding the Cord*.—If the cord is twisted round the lower limbs or trunk, pull on a loop to slacken it, then slip it over the breech till it hangs free.

Sometimes the cord passes between the thighs, so-called riding the cord. Pull on the portion which is running up the back, and, when it is sufficiently slackened, slip it over the hip.

5. *Displacement of Arms above Head*.—This usually occurs in delivery by traction.

It delays the birth of the trunk, and pressure on the nerves of the brachial plexus in the cervical region may cause paralysis of the arm. Bring down the left arm with the left hand and the right arm with the right hand. Swing the trunk well forward towards mother's abdomen, and bring down the posterior arm first. Then swing the child back and bring down the anterior arm.

6. *Extension and Impaction of After-coming Head*.—Extract by hand grip, or failing this by forceps, aided by an assistant expressing on the fundus uteri.

In *flat pelvis* the head remains high at the brim. Place the patient in the hanging-leg position and deliver the head as above, but, if the child is dead, perforate.

7. *Malrotation of Occiput into the Hollow of the Sacrum*.—This is rare apart from faulty extraction by the posterior leg instead of the anterior. Try and manually rotate the head so as to bring the occiput forward. If this fail, carry the trunk well back and bring down the chin by the hand grip or by forceps. When born as far as the root of the nose bring the occiput over the perineum.

8. *Extension of Malrotated Head*, the chin being above the symphysis pubis (Fig. 92).—Bring down the occiput, aided



by expression. If this fail, apply forceps, or, if required, perform craniotomy.

9. *Contraction of Cervix round Neck*.—This is usually due to faulty traction, especially after the leg is brought down, before the cervix is sufficiently dilated. Chloroform the patient, then try and push the edge of the cervix up over the chin and mouth, then deliver by traction, aided by expression.

If this fail, and the child is alive, make multiple incisions round the os with curved scissors, and then extract.

If the child is dead, haste is not necessary, so wait till the cervix dilates naturally and then deliver.

#### 14. Transverse Lie. Cross Birth. Shoulder Presentation.

*Frequency*.—1 in 230 cases.

*Varieties*.—1. *Shoulder Presentation* (Fig. 93).—This is the most frequent. The child has its normal flexed attitude, but

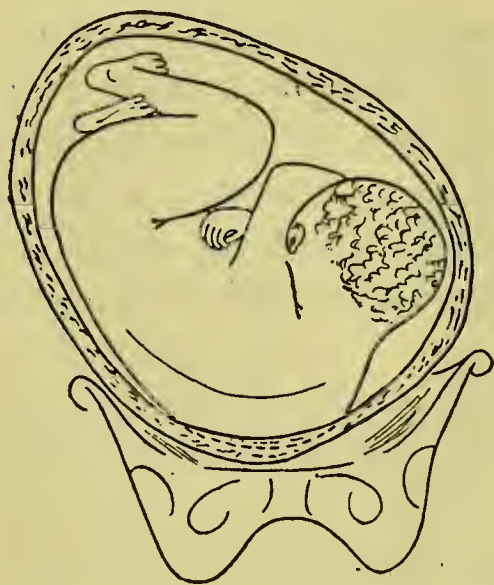


FIG. 93.—SHOULDER PRESENTATION.  
FIRST POSITION, L.A.A.

lies on its side obliquely across the uterus, the head being in the iliac fossa and the breech higher up on the opposite side. The shoulder presents over the cervix.

2. *Arm Presentation*.—The lie of the child is as above, but the hand or elbow presents, or the arm descends first into the vagina after the membranes rupture (Fig. 94).

3. *Trunk*.—The lie of the foetus is more transverse, so that, instead of the shoulder, some part of the thorax or upper part of trunk presents, the examining finger feeling *ribs*.

*Cause*, as under "Breech Cases," p. 223.

*Diagnosis*.—*External Examination*. 1. *Membranes intact*.—The uterus is obliquely elongated from side to side. The fundus uteri is empty. The head is felt low down on one side in the iliac fossa, the breech higher up on the opposite side (Fig. 93).

The palpating fingers at the brim get below the presenting part. The foetal heart is not much help, as it may be loudest near the umbilicus or lower down at the side on which the head lies. According to the position of the foetus as regards dorso-anterior or dorso-posterior the back or the small parts are felt more distinct lying anteriorly.

2. *Membranes ruptured*.—If the liquor amnii has all escaped, and the uterus is moulded on the foetus, diagnosis by external palpation is difficult.

*Vaginal Examination. Membranes intact*.—Note finger-like pouching of the bag of membranes, which tend to rupture early. *The os uteri is high up*, and the presenting part is difficult to reach.

*Membranes ruptured*.—1. *The shoulder* is soft and the acromial process is felt with three bones—the humerus, clavicle and spine of scapula—radiating from it. Pass the finger into the axilla and feel the ribs. The scapula indicates the foetal back, the clavicle the front and the axilla points towards the feet, so you can tell the position. *The shoulder* if swollen may be difficult to diagnose, so if in any doubt chloroform the patient, pass the hand up to the cervix and pull down a limb.

2. *Arm*.—Feel the hand in line with the limb, the fingers of unequal length, and the thumb can be flexed into the palm. The hand slips through the fingers on catching it.

3. *Elbow*.—Feel the olecranon as a bony projection with a dimple on each side.

4. *Trunk*.—It is difficult to tell unless ribs are felt. If in doubt, chloroform the patient, put up your hand into the uterus and pull down a limb.

5. *If the arm is prolapsed* the diagnosis is certain, and you can tell the foetal position by holding its hand supine, when the thumb points to the head and the back of the hand to the foetal back (Fig. 94). You can tell whether it is the right or left arm which is prolapsed by grasping the hand with your corresponding hand.

**Differential Diagnosis**.—Between breech and transverse, foot and hand, groin and axilla, see p. 224.

**Positions**.—There are four positions—two dorso-anterior, head to right or left, the commoner, and two dorso-posterior, head to left or right.



The frequency of occurrence is in the following order :

1st. L.A.A.—Left acromio-anterior or left acromio-iliac dorso-anterior. Right shoulder presents, back lies anterior, and head to left (Fig. 93).

2nd. R.A.A.—Right acromio-anterior or right acromio-iliac dorso-anterior. Left shoulder presents, back lies anterior, and head to right.

3rd. R.A.P.—Right acromio-posterior or right acromio-iliac dorso-posterior. Right shoulder presents, back lies posterior, and head to right.

4th. L.A.P.—Left acromio-posterior or left acromio-iliac dorso-posterior. Left shoulder presents, back lies posterior, and head to left.

**Prognosis.**—*Mother.*—The earlier the case is seen the more favourable; the more advanced the graver from delay, exhaustion, the greater difficulty of necessary interference, the greater risk of sepsis. If left alone the case *usually ends in rupture of the uterus* and death of the mother and child, as spontaneous delivery with a full-sized child is almost impossible. *Child.*—Very grave, as about 40 to 50 per cent. die. Prolapse of the cord is common. If the case is recognized early, so that version is easily performed, the risk is the same as for breech cases.

#### Natural Termination if left to Nature.

1. *Rupture of the Uterus.*—This is the usual termination if the labour occurs at full time, and the case is left to nature. It is *fatal* to mother and child.

The membranes rupture early, permitting the escape of all the liquor amnii, and a large caput succedaneum forms on the presenting shoulder. The arm may be forced down, and as it lies prolapsed in the vagina it becomes greatly swollen and blue in colour. As labour continues the shoulder becomes firmly impacted in the pelvic brim, and the uterus being completely drained of liquor amnii adapts itself to the foetus. The pains become colicky and the uterus, endeavouring to overcome the obstruction, gets into a state of tetany. As the upper segment of the uterus retracts, diminishing its cavity, the retraction ring rises more and more, forming a ridge running obliquely upwards (Fig. 94). At the same time the lower uterine segment gets more and more stretched, forming

a cavity into which the foetus is driven, and the wall gets thinner until finally, during the height of a pain, the thinnest portion, where it is stretched over the foetal head, gives way.

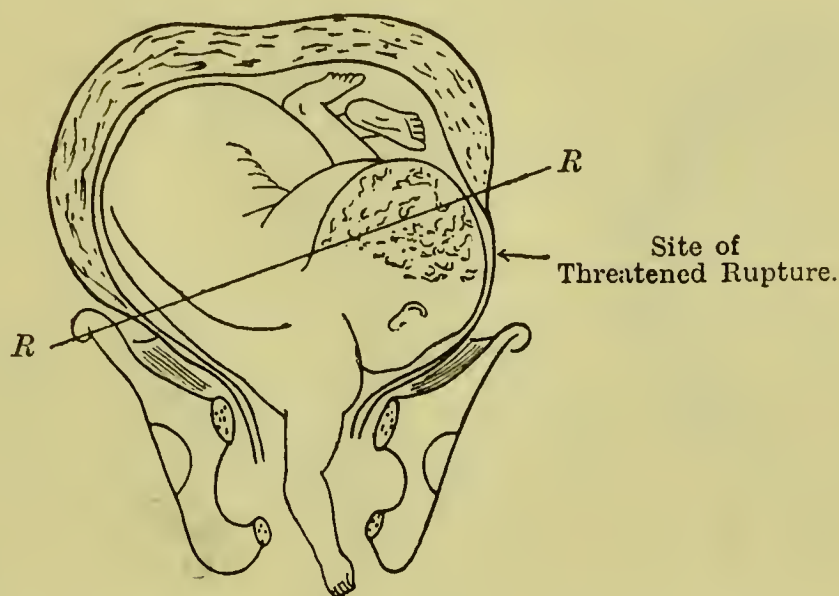


FIG. 94.—TRANSVERSE PRESENTATION. PROLAPSE OF THE ARM AND THREATENED RUPTURE OF THE UTERUS DURING THE FIRST STAGE OF LABOUR.

R.R. = Retraction Ring.

The uterus has ruptured, and, if the tear is complete, the foetus in part or whole passes through the rent into the abdominal cavity (see “Rupture of the Uterus”).

2. *Uterus may become exhausted.*—The pains stop and the child dies. The mother usually dies undelivered from exhaustion or sepsis.

3. *Spontaneous Rectification above the Brim.*—Extremely rare. It becomes a head case by a mechanism corresponding to cephalic version, and it requires (a) intact membranes, (b) uterine contractions, (c) child alive or newly dead.

4. *Spontaneous Version (Denman).*—It occurs at the brim just after rupture of the membranes and before the uterus has retracted on the foetus. The breech comes down by a movement corresponding to podalic version.

5. *Spontaneous Delivery or Evolution.*—This may occur if the foetus is premature, small or macerated. Ribemont-Dessaigues took photographs (Figs. 95, 96, 97) of the spontaneous delivery of a 5½ lbs. foetus from a dorso-anterior head-to-right position. The mechanism was as follows :

(1) Prolapse of posterior (left) arm and shoulder and doubling of foetus together (Fig. 95). Next (2) anterior (right) shoulder came out under the pubic arch (Fig. 95). Then (3) the back



was expelled in the transverse diameter of the outlet (Fig. 96).

(4) Rotation took place, viz. forward rotation of the shoulders (Fig. 97) bringing the neck under the pubic arch. At the



FIG. 95.



FIG. 96.



FIG. 97.

FIGS. 95-97.—SHOULDER PRESENTATION. BIRTH BY SPONTANEOUS EVOLUTION. (After Ribemont-Dessaignes and Lepage.)

same time (5) expulsion of the breech occurred, followed by the legs coming out over the perineum. (6) The after-coming head was delivered as in breech cases.

6. *Spontaneous expulsion by Corpore Conduplicato* (Fig. 98).—The child is driven straight out doubled up, with the head against the abdomen and one arm leading. It is only possible with a small premature foetus.

**Treatment.**—Chloroform the patient and perform version as soon as the case is diagnosed, unless contraindicated.

1. *Membranes intact.*—External version should be tried first, but it is not easily performed. The usual treatment is to perform podalic version by the bipolar method as soon as the os admits two fingers easily.

For indications under which cephalic version may be tried, see “Obstetric Operations.”

2. *Membranes ruptured.*—Podalic version by the internal manual method must be done, the cervix being first dilated if too small to admit the hand.

3. *Shoulder impacted in Pelvis.*—Deeply chloroform the patient, and try podalic version by the internal method, exercising the greatest care to avoid rupturing the lower uterine segment. If this fail, or if it seem that the risk

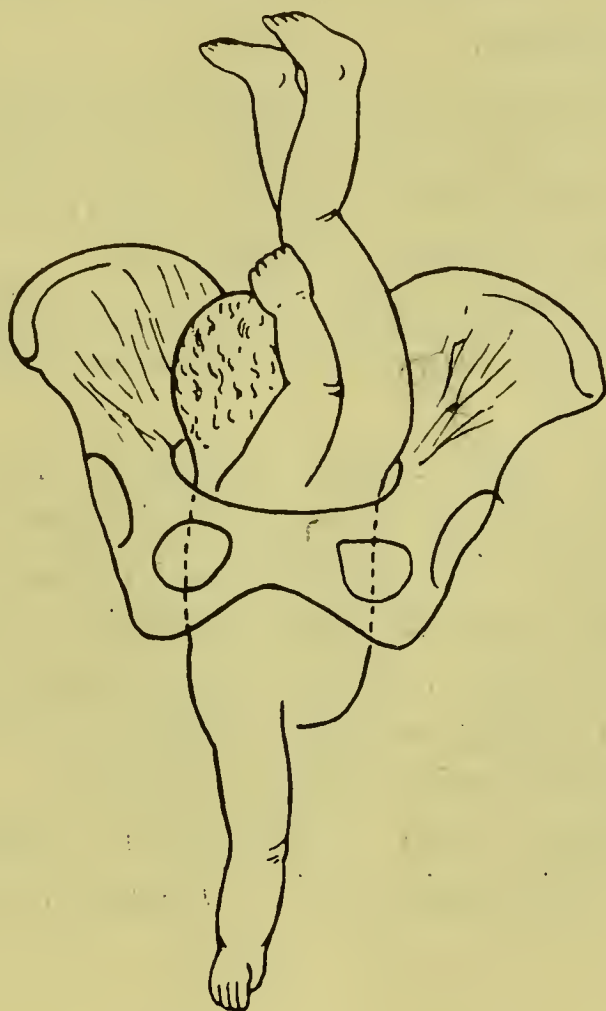


FIG. 98.—SHOULDER PRESENTATION. SPONTANEOUS DELIVERY BY CORPORE CONDUPLICATO.

is too great, owing to thinning of the lower uterine segment, and that attempts at version are not justifiable, then decapitate, or if the neck cannot be reached perform evisceration and spondylotomy.

*Threatened rupture of the Uterus.*—No attempt should be made to turn, so decapitate.

*The Uterus has ruptured.*—See “Rupture of the Uterus.”



#### IV. Complex Labour on Part of Mother.

*Classification of causes of haemorrhage during pregnancy, labour, or post-partum.*

1. *Early Pregnancy*.—(a) Threatened or actual abortion; (b) carneous mole; (c) vesicular mole; (d) ectopic gestation; (e) menses (rare), causes apart from pregnancy, such as carcinoma of cervix, polypus, ruptured varicose veins.

2. *Late Pregnancy*.—Ante-partum haemorrhage. (a) Accidental haemorrhage; (b) unavoidable haemorrhage from placenta praevia.

3. *First Stage Labour*.—(a) Accidental haemorrhage; (b) unavoidable haemorrhage; (c) rupture of uterus; (d) rupture of vessel in velamentous insertion of cord; (e) laceration of cervix.

4. *Second Stage Labour*.—Tears of cervix or vagina.

5. *Third Stage Labour*.—(a) Atony of uterus; (b) hour-glass contraction; (c) partly adherent placenta; (d) inversion of uterus; (e) tears of cervix, vagina, or vulva.

6. *After Delivery*.—(a) Post-partum haemorrhage from placental site; (b) inversio uteri; (c) tears of cervix, vagina, or vulva.

##### 1. Placenta Praevia and Unavoidable Haemorrhage.

**Definition**.—Implantation of the placenta in greater or less part on the lower uterine segment. Separation of the praevial portion causes unavoidable or inevitable haemorrhage.

**Cause** (commoner in multiparae).—1. Embedding of the ovum in the lower uterine segment (cause unknown) = basal placenta praevia.

2. Persistence of villi, and development of some of the placenta on the lower part of the decidua capsularis, which comes to lie over the lower uterine segment = capsular placenta praevia.

Endometritis is supposed to favour this by causing excessive growth and vascularization of the decidua capsularis, so that the villi adherent to the lower pole do not atrophy, as is normally the case.

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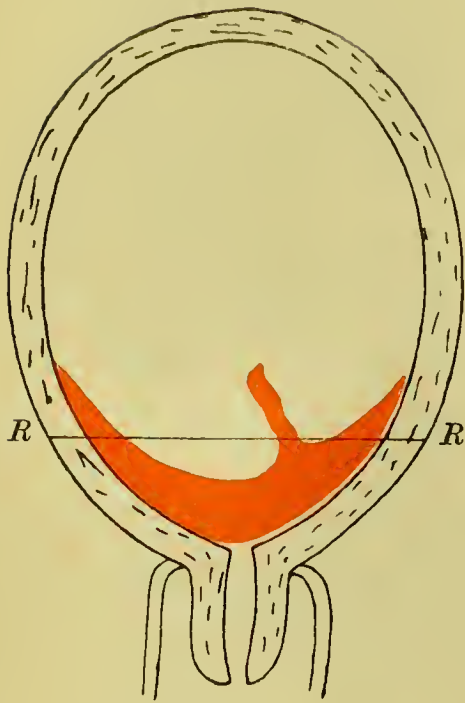


FIG. 99.—CENTRAL.

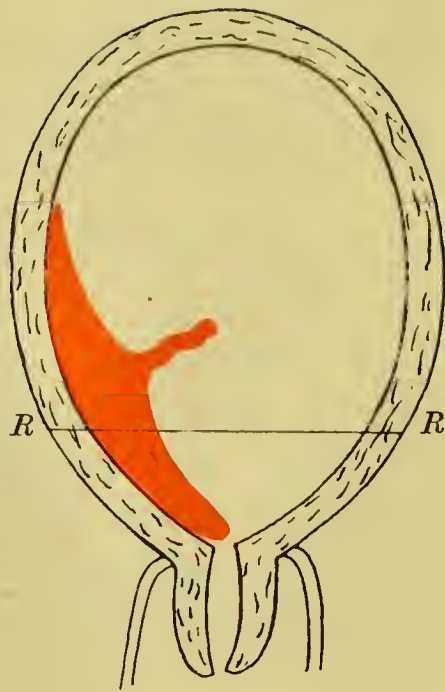


FIG. 100.—LATERAL.

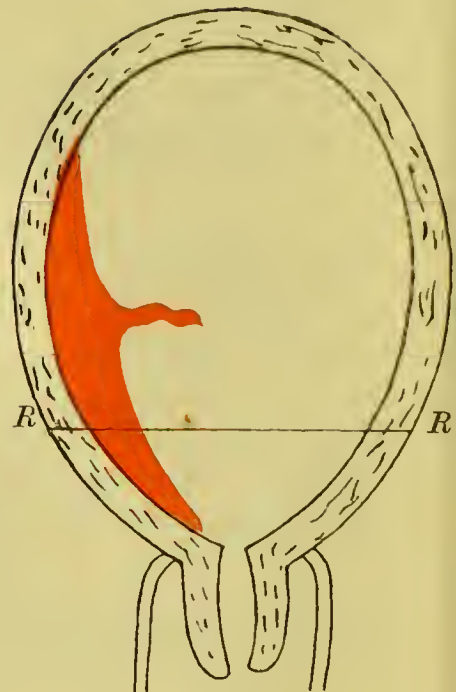


FIG. 101.—MARGINAL.

#### VARIETIES OF PLACENTA PRAEVIA.

*R.R.* Retraction Ring marking the upper boundary of the Lower Uterine Segment.

*To face p. 239.*

**Varieties.**—1. *Central or Complete* (Fig. 99).—The placenta is implanted over a large area of the lower uterine segment, and only placenta presents when the cervix dilates.

*Incomplete.*—2. *Partial or Lateral* (Fig. 100).—The edge of the placenta reaches to or slightly overlaps the os internum. When the cervix dilates, the edge of the placenta and membranes present.

3. *Marginal* (Fig. 101).—A small portion is attached to the side of the lower uterine segment; after the cervix dilates, the edge of the placenta may be felt, but it does not present.

**Pathology.**—The lower uterine segment gets passively stretched and its area increased by the uterine contractions. The praevial portion of the placenta cannot stretch, and thus it separates at the spongy layer, so that the utero-placental (maternal) vessels in the decidua are torn across and intervillous spaces opened. From these torn vessels and intervillous spaces comes the haemorrhage called *unavoidable haemorrhage*.

Slight *expansion* of the lower uterine segment accounts for *haemorrhage in the later months of pregnancy*.

*Haemorrhage* may also be due to *partial detachment* of the placenta without *any opening* of the cervix, a condition analogous to accidental haemorrhage, but in a praevial placenta.

In certain cases of *marginal placenta praevia*, there may be no *haemorrhage* during labour, because the praevial portion is pathologically adherent, as in adherent placenta. The *more central the placenta the greater is the bleeding* likely to be, since a larger area of the placenta is detached; therefore the *more central the praevia the greater the danger*.

**Symptoms.**—It may cause abortion in the early months, but usually no symptoms arise till after the sixth month.

The *only symptom is spontaneous haemorrhage*, and there is no pain unless labour has begun. The *danger* arises from the *haemorrhage*.

There may be a sudden onset of bleeding from no apparent cause, and the patient may be lying quiet in bed when it starts.

The bleeding may be *moderate* at first, or it may be so *sudden and profuse* as to demand immediate treatment. It may cease and recur at intervals of days or weeks before the onset of premature or full-time labour occurs, when the bleeding may come in irregular gushes or be continuous.



*Complete Placenta Praevia.*—In the *complete variety*, the bleeding usually comes on from the *twenty-eighth to the thirty-sixth week*.

*Partial Placenta Praevia.*—In the *incomplete variety*, haemorrhage usually begins *after the thirty-second week*, or it may be *not till the first stage* of full-time labour.

*Symptoms at Onset of Labour.*—(a) *Central Variety.*—When labour begins in the central variety, and the lower uterine segment is being stretched, more and more of the placenta is separated, and the resulting bleeding may be so profuse that, if not speedily checked, the patient soon dies of acute anaemia.

(b) The *incomplete variety* is not so dangerous, as there is less placenta to separate, and therefore less profuse bleeding.

The haemorrhage may also be checked after the membranes rupture by the head coming down and compressing the detached portion.

The signs and symptoms of acute anaemia depend on the amount of blood lost, and this amount can be estimated, as all the blood escapes externally and is therefore visible, with the exception of a small portion which may be retained in the vagina as clot.

**Diagnosis.**—*External Examination.*—Malpresentation may be noted, and the presenting part is high up owing to the presence of the placenta in the lower uterine segment.

*Vaginal Examination.*—Blood-clot is found in the vagina, and the haemorrhage is coming out of the cervical canal. The fornices are soft and boggy in the central variety, because the lower uterine segment is thicker and more vascular where it is covered by placenta. For the same reason the presenting part is not so distinctly felt, and ballottement before the thirty-second week is indistinct.

These signs will be absent in the *marginal variety*, especially if the placenta lies posteriorly. The *most important* sign in doubtful cases is feeling the placenta spongy and granular, if the finger can be forced through the cervix.

**Differential Diagnosis.**—1. *Between Blood-clot and Placental Tissue.*—*Blood-clot* is like jelly, soft and pliable, breaks up easily with the finger, and is readily removed.

*Placental tissue* is tough and fibrous, tears on forcing the finger through it, and pieces cannot be removed unless torn off.

2. *Between Unavoidable and Accidental Haemorrhage.*—See “Placenta Ablata,” p. 247.

3. *Haemorrhage from cancer* of the cervix or ruptured varicose veins must be excluded. Cancer is easily felt, and the haemorrhage comes from the ulcerated surface of the growth.

The haemorrhage from ruptured varicose veins does not come through the cervix, and its source is easily seen.

**Prognosis.**—*Mother.*—Liable to premature labour, malpresentation, inertia, and delay in the first stage, as no bag of membranes can form in the complete variety.

*The lower uterine segment is very friable* owing to the presence of the large sub-placental venous sinuses, and is thus readily torn, leading to serious haemorrhage if forcible attempts are made to dilate the cervix.

The prognosis is *very grave*, especially in the complete variety, from loss of blood, necessary interference, liability to post-partum haemorrhage, air embolism, and sepsis.

*The risk of sepsis* is increased owing to (a) undue interference; (b) loss of blood; (c) exhaustion; (d) placental site being near cervix, and thus nearer the seat of manipulation.

The *greatest danger* arises if *post-partum haemorrhage* should occur, not only because the patient can ill-afford further loss of blood in addition to what she has already lost during labour, but because it is so difficult to check, and tamponades of the uterus and vagina are not so effective as in cases of post-partum haemorrhage from a normal placental site. The maternal mortality is now from 5 to 10 per cent. as judged by hospital statistics and correct treatment, but it may be much higher, especially with central placenta praevia, if cases are unskilfully managed.

*Child.*—The prognosis is always grave, and practically hopeless in central placenta praevia. The mortality varies from 40 to 84 per cent., due to asphyxia, version, and prematurity. In some hospitals the hydrostatic bag treatment seems to have given a lower mortality, both for mother and child, than treatment by version.

**Treatment.**—I. *Haemorrhage Slight, and occurring during Seventh or Eighth Month.*—Try absolute rest in bed and opium, but the patient must be kept under constant observation, and instructions given to send at once for you should bleeding recur or get severe.



If *complete placenta praevia* is diagnosed, even if the bleeding is slight, *induce labour*, as the *risk of expectant treatment* is too great, and there is little chance of getting a living child. (See below, III.)

II. *Haemorrhage is Severe, or the Case demands Immediate Treatment.*—(A) *Incomplete Variety.*—The safest treatment for the mother in general practice is to do bipolar version (Fig. 102) whenever the os admits two fingers, and pull down a foot till the leg plugs the cervix.

*Other Methods.*—(a) You may first try rupture of the membranes, as the head may then descend and compress the placenta.

(b) If this fail, and the os is small, insert “de Ribes’” bag (Fig. 103).

(c) If the uterus is atonic, and the os is large enough, apply forceps and keep the head pressed on the cervix.

(d) If these fail, turn and bring down a foot, but this is now more difficult to do through previous rupturing of membranes.

*Breech.*—In *breech* presentation bring down the anterior foot.

In *transverse* presentation, turn at once and bring down a foot.

(B) *Central Variety, and Os open enough to admit Two Fingers.*

—1. *Bipolar Version.*—The best and safest treatment for the mother in general practice is bipolar version, with slight traction on the leg, and slow delivery. Place the patient in the dorsal position, perform version, and when the breech is



FIG. 102.—TREATMENT OF PLACENTA PRAEVIA BY BIPOLAR VERSION.

The Foetus has been turned and the leg pulled down till it plugs the Cervix.

down pass your fingers round the edge of the placenta, or, if this fail, bore through it with your finger. Then seize a foot and pull it down till the leg completely plugs the cervix and

the bleeding is checked (Fig. 102). Then *leave to nature*, only keeping the cervix plugged by *gentle traction* on the leg sufficient to check bleeding should it occur.

On *no account* be tempted to deliver rapidly by extraction in the hope of saving the child, since the highly vascular cervix will tear very easily, and the danger of fatal haemorrhage is very great.

2. *Hydrostatic Bag Method* (Fig. 103).—The hystereurynter has given, in skilled hands, as good results as, if not slightly better than, bipolar version, but, on the other hand, equally skilled operators have still found that bipolar version is better than the rubber bag.

If necessary, the cervix is dilated sufficiently, but with great care, to such a size as will permit the introduction of de Ribes' bag. The *membranes* must be *ruptured* and the collapsed and rolled-up bag then introduced by forceps into the lower uterine segment.



FIG. 103.—HYDROSTATIC BAG METHOD OF TREATING PLACENTA PRAEVIA.

Fill the bag with air or sterile water, and exert gentle traction to keep the cervix plugged, leaving expulsion to nature.

III. *Bleeding is Severe, but the Cervix is closed or Labour has not begun*.—1. *Tamponade*.—Place the patient in the dorsal position. Empty the bladder and, if there is time, the bowel as well. Thoroughly cleanse the vulva and vagina with an antiseptic, and cut or shave the vulvar hair. Pack the vagina firmly with pledgets of wadding wrung dry out of an antiseptic. Begin by packing the fornices full so as to exert pressure on the lower uterine segment, then add more till the vagina is full. Some recommend a colpeurynter to plug the vagina, *i.e.* a round rubber bag which is filled with lotion till the vagina is tightly filled. The method is painful and not so good as the tampons. Gauze is *useless* for tamponade, as the blood soon trickles through it. The tamponade of the vagina not only checks the haemorrhage but may start labour, if not begun.

The tampons should be removed in six or eight hours. If the cervix is not yet open enough to admit two fingers for



bipolar version, fresh tamponade may be done, or the cervix may be dilated, but remember the great risk of tearing the friable tissues. As soon as the os admits two fingers, perform bipolar version.

2. *Caesarean Section*.—This is only an operation for the specialist, and is only justified if both parents are willing to run the risk and the interests of the child are of great importance. It can only be indicated if the cervix is closed and rigid, and if sepsis is excluded. Supra-pubic or extra-peritoneal caesarean section has also been done, but it is questionable if it is ever justified, although the results in a few cases have been good.

3. *Ligation of the Uterine Arteries*.—This has been done in several cases of central placenta praevia. The cervix is pulled down, the uterine arteries palpated, and a ligature passed round each and tied. The cervix is then dilated.

IV. *Haemorrhage in Third Stage*.—Separate and remove the placenta at once, and bimanually compress the uterus, and treat further as in post-partum haemorrhage.

Should there be no haemorrhage, manage the third stage as in normal labour.

V. *Post-partum Haemorrhage*.—Should haemorrhage occur, due to atony of the uterus or severe tear of the vascular cervix, which cannot be quickly controlled, tampon the uterine cavity with sterile gauze and plug the lower uterine segment, cervix and vagina with pledgets of cotton wadding wrung out of an antiseptic lotion. The pledgets are removed in twenty-four hours, the gauze in forty-eight hours.

For details of treatment see "Post-partum Haemorrhage."

If tamponade will not check the haemorrhage, and it may fail, supra-vaginal hysterectomy is advised. This is a desperate remedy impossible outside a hospital.

All manipulations should be performed with the patient in the dorsal position and shoulders raised to avoid the risk of air embolism.

## 2. Placenta Ablata and Accidental Haemorrhage.

*Definition*.—Haemorrhage due to the separation of a normally situated placenta and occurring during the latter half of

Geo





FIG. 104.—EXTERNAL ACCIDENTAL  
HAEMORRHAGE.



FIG. 105.—INTERNAL ACCIDENTAL  
HAEMORRHAGE.

VARIETIES OF PLACENTA ABLATA.

*To face p. 245.*

pregnancy, usually after the sixth month, or during the first stage of labour. If it occurs during pregnancy it usually leads to the onset of premature labour.

*Mechanism of Ablatio Placentae.*—The mechanism closely simulates that of abortion. A retro-placental haematoma of small size first forms and separates a portion of the placenta sufficiently to form a cavity containing blood. A uterine contraction compresses this collection of blood, which wedges off a further area of placenta, and the action continues until finally a greater or less portion is completely separated, and the blood makes its way between the chorion and the decidua, thus stripping off the membranes.

#### Varieties of Placenta Ablata.

(A) *External.*—Visible or apparent accidental haemorrhage (Fig. 104). Blood or serum strips up the membranes as far as the cervix, and escapes through the os and per vaginam.

**Results.**—(a) Most of the blood escapes externally from the uterus.

(b) A little blood escapes externally, but most accumulates in the uterus, so that the amount seen escaped per vaginam does not show the full extent of the haemorrhage.

(c) The blood may clot in the uterus, and only blood serum escapes per vaginam.

(B) *Internal or concealed* (Fig. 105).—The blood is all retained in and distends the uterus.

**Results.**—(a) The whole placenta may separate as far as its margin, and a large quantity of blood accumulates between the placenta and the uterine wall.

(b) The placenta may partly detach, and the blood collects between the detached portion of the membranes and the uterine wall.

(c) The blood may rarely break through into the amniotic cavity.

**Cause.**—It occurs more frequently in multiparae and debilitated women.

(A) *Traumatic.*—Tearing of the utero-placental blood vessels, causing haemorrhage and detachment of placenta from (1) *external violence*, e.g. a kick or a fall; (2) *undue exertion*, strain or severe vomiting, causing sudden increase in intra-abdominal



pressure. These are probably chiefly contributory causes detaching a placenta already affected by local disease, as in few instances will injury detach a healthy placenta.

(B) *Spontaneous*.—(1) Decidual endometritis in decidua basalis—a frequent cause; (2) congestion of decidua secondary to chronic nephritis; (3) seen in anaemia, syphilis, tuberculosis, alcoholism, cardiac disease; (4) fibroids.

**Symptoms.**—These vary according to the severity of the case, the degree of separation of the placenta and the amount of blood effused.

1. *Slight* detachment of the placenta with local clotting causes no symptoms.

2. *Slight cases* of the *external* variety may have haemorrhage as the *only* symptom.

3. *Severe Cases due to Copious Haemorrhage*.—The symptoms occur most commonly during the eighth or ninth month, and may come on *suddenly* without any history of injury or undue exertion. There is collapse, pallor, faintness, exhaustion and sometimes syncope. The patient is cold and restless, the pulse rapid and weak, 120 or more, the temperature subnormal, and the respiration sighing. *Locally* she may complain of sudden and continuous pain in the abdomen, and a feeling of distension or pressure in the region of the uterus. Blood or serum may be seen escaping in the *external* and commoner variety, but the *gravity* of the case depends on the *symptoms* and *not* on the amount of *blood* seen, as much is retained in the uterus. In the *concealed*, the most serious variety, no haemorrhage is seen.

If labour sets in, the uterine contractions may expel the accumulated blood.

**Signs.**—If the bleeding is limited, palpation of the uterus is negative.

In *severe cases*, where much blood collects, you may notice or feel an irregular distension of the uterus.

If the *uterus* is *contracted* it is *tense* and *tender* to palpation. If *not* contracted it feels *boggy*.

It is difficult or impossible to feel foetal parts or to hear the foetal heart if examined through accumulated blood. Vaginal examination is negative beyond the presence of blood or clot in the external variety, and, if the os admit the finger, no placenta is felt.

**Differential Diagnosis.**—1. Between accidental and unavoidable haemorrhage. A history of injury is of no value, as this may separate a placenta praevia.

*Accidental Haemorrhage.*

*Unavoidable Haemorrhage.*

- |  |  |
|--|--|
| <p>1. The symptoms are independent of visible haemorrhage and with the concealed variety there is no blood seen. The escaping blood is frequently dark coloured.</p>   | <p>1. The only symptom is visible haemorrhage. The escaping blood is red.</p>  |
| <p>2. Pain and feeling of distension in the abdomen.</p>   | <p>2. No local pain nor distress.</p>  |
| <p>3. The severity of the symptoms such as pallor, collapse, fainting, rapid pulse, is <i>independent</i> of the amount of <i>visible</i> blood lost, as only some escapes, most being retained in the uterus.</p> | <p>3. The symptoms are those of acute anaemia and <i>depend</i> on the amount of <i>visible</i> blood lost, as it all escapes and is never retained in the uterus.</p> |
| <p>4. Vaginal examination is negative, there is no boggy feel of fornices, and the presenting part is felt as usual.</p>   | <p>4. The fornices are soft and boggy, and the presenting part is kept high up by the placenta and is not distinctly felt.</p>   |
| <p>5. No placenta is felt on passing the finger through the cervix, if this can be done.</p>   | <p>5. Placenta is felt.</p>  |

2. *From Rupture of the Uterus.*—This, as a rule, only occurs after the *first stage* has been in progress for *several hours* with the membranes *ruptured*, the pains severe, the lower uterine segment *overstretched* and thin, and the retraction ring pulled up. Collapse and bleeding are followed by sudden temporary relief from severe labour pains.

3. *From Syncope.*—The haemorrhage, local distress and severity and *persistence* of the symptoms exclude syncope.

**Prognosis.**—This depends on the previous condition of the patient, the severity of the shock, the amount of blood lost, and the treatment adopted. The concealed form is very grave. The mortality averages 40 per cent. under active treatment by version or *accouchement forcé*. The Rotunda method of treatment has given a low mortality. *Child.*—Very grave. The mortality is 85 per cent. or more.

**Treatment.**—In *slight cases* occurring during pregnancy, with bleeding as the only symptom, *palliative* measures should be



tried, such as rest in bed, ice bag to the abdomen, opiates, careful diet, and attention to bowels. Calcium lactate gr. xv thrice daily may be tried to favour clotting, but is contra-indicated if there is kidney disease. For *severe cases* there is as yet no generally accepted method of treatment.

**I. Rotunda Methods which have given good Results.—**

(a) *External variety*, bleeding not severe, patient in labour, pains good, membranes intact, and os fairly well dilated. Rupture the membranes, apply a tight binder and watch. This usually suffices, but, should bleeding continue, then you must complete dilatation of the cervix, and turn, or use forceps.

(b) *Most important class* of case is where the pains are feeble or absent, the membranes intact, and the os not much dilated. Empty the bladder, cleanse the vulva, and give an antiseptic vaginal douche. Then *plug the vagina*, using the fingers of one hand as a speculum and for packing in the pledgets. Use pledgets of cotton wool, walnut size, wrung out of a weak antiseptic, and pack firmly into the fornices round the cervix, till the vaginal vault is packed full. Then plug the *whole* vagina to its *utmost capacity*. Apply a pad and diaper to the vulva, then place a tight binder round the abdomen to *compress the uterus*, and fasten the diaper to the binder. Stimulate the patient, and wait till good labour pains come on. The plugs may be expelled, but are removed if necessary, and labour ends naturally. Watch for post-partum haemorrhage.

(c) *Concealed variety* during pregnancy with closed os is rare, and requires vaginal or abdominal caesarean section.

**II. Other Methods.—1. Slight Cases.**—Palliative as above, but if bleeding continue induce labour by de Ribes' bag, followed, if indicated, by manual dilatation and version, or, if the cervix is fully dilated, use forceps.

2. *Haemorrhage Severe, but Case not Critical.*—Place the patient on her back with head low, and raise the lower end of the bed. Give a high enema of normal saline. Dilate the cervix, and when open enough do bipolar version, then rupture the membranes, pull down a leg and slowly deliver, aided by expression of uterus. If the foetus is dead *perforate*, as it can thus be sooner delivered through a smaller cervix. If the cervix won't dilate quickly enough, do vaginal caesarean section.

3. *Cases of Severe Shock and Haemorrhage.*—First treat the shock by saline infusions, and then dilate the cervix, and when open enough, perforate the foetus and empty the uterus. In all cases following *accouchement forcé* remove the placenta at once, and guard against post-partum haemorrhage by ergot, hot douches, compression of uterus or uterine tamponade.

*Treatment of Shock.*—Lower the patient's head, elevate the foot of the bed. Give a hypodermic of morphia gr.  $\frac{1}{6}$  and one or two of strychnine (gr.  $\frac{1}{30}$ ) or ℥ xv of infundibular extract. Infuse saline per rectum, subcutaneously, or into a vein. Pack hot bottles round the patient.

### 3. Rupture of Uterus.

*Mechanism of Rupture.*—This is usually a tension tear of the lower uterine segment due to obstructed labour, and occurs after the first stage has been in progress for several hours. The membranes have ruptured early, allowing the liquor amnii to drain away, so that the uterus adapts itself to the foetus. The upper segment of the uterus, in its endeavour to overcome the obstruction, retracts more and more and thickens, diminishing its cavity, and with this the retraction ring rises. The cervix, however, is fixed between the presenting part and the pelvis, and as the retraction ring rises with the thickening and progressive retraction of the body of the uterus, the lower uterine segment and cervix are pulled upon and stretched to form a cavity into which the foetus is driven. As a consequence, the wall of the lower uterine segment becomes enormously overstretched and thinned, the part where it is most thinned being over the occiput in vertex presentation, and over the head in shoulder presentation. Finally, at the part of greatest thinning, the wall of the lower uterine segment suddenly bursts during a uterine contraction—the uterus has torn or ruptured.

The tear may be longitudinal or transverse, but it is most usually oblique and towards one side of the anterior or posterior wall. It may extend as high as the retraction ring, and downwards to the cervix, or even into the vagina. In rare cases the uterus may be completely torn across.

*Rupture of the Upper Uterine Segment.*—A tear of the body above the retraction ring is rare, and is usually the result of



antecedent disease, or occurs at the scar of a former caesarean section. There are a *few recorded cases of rupture* of the upper uterine segment during normal labour without any obstruction, the uterine wall being found deficient in elastic tissue.

**Varieties.**—1. *Complete or Perforating.*—The tear is through all three coats into the abdominal cavity, and forms a ragged wound.

2. *Incomplete.*—The tear is into or through the muscle, but the peritoneum remains intact. The peritoneum may, however, strip off to a considerable extent round the tear, when blood collects between the stripped-off portion and the muscular wall to form a subperitoneal haematoma.

A *tear* low down in the *lateral wall* will pass into the broad ligament, and is incomplete in so far that although the whole uterine wall is torn through, the peritoneum is intact, and there is no communication with the abdominal cavity. This tear may, however, become complete, the peritoneum being ruptured by the foetus being driven through the tear or by the operator during his manipulations.

**Etiology.**—I. *Spontaneous.*—The tear is oftener complete when due to obstructed labour. The passage of the foetus is obstructed by—

(a) Faults in the passages :

1. Contracted pelves ; minor degrees are worse than great contraction, as the presenting part may partly engage and thus fix the cervix lower down.
2. Tumours of pelvis.
3. Atresia vaginae.
4. Occlusion of cervix.
5. Fibroid of uterus in the hollow of the sacrum.
6. Ovarian tumour in the pouch of Douglas.

(b) Faults in the foetus :

1. Hydrocephalus.
2. Transverse lie.

The commonest causes are deformed pelves, transverse lie, and hydrocephalus.

II. *Traumatic.*—The tear is oftener incomplete when due to traumatism from :

1. Attempting version or using forceps when the lower uterine segment is over-stretched as in threatened rupture.

2. Forcible dilatation of the cervix by de Ribes' bag or metal dilators such as Bossi's.

3. Injury by instruments used for craniotomy. The perforator may slip.

III. *Abnormalities in the Uterus itself*.—1. Softening and degeneration from antecedent disease such as cancer of cervix.

2. Rupture through the cicatrix of a former caesarean section. This is now comparatively rare, and was more liable to occur after the fundal incision.

3. Mis-direction of the uterine axis, especially following vaginal or very firm abdominal fixation of the uterus through operations for displacements.

4. Deficient elastic tissue in the uterine wall. The rupture involves the body of the uterus.

**Symptoms and Diagnosis of Threatened Rupture of the Uterus.**—There is a history that the patient has been several hours in labour, that the pains have been getting more severe, and that the waters have come away.

The patient is now restless and has an anxious look, the pulse is quick, and the temperature may be slightly raised.

The pains are severe, and may be continuous and crampy—tetany of uterus—so that the patient has little relief from her sufferings between the contractions, and complains of severe bearing-down pain.

*Abdominal Examination.*—The uterus above the retraction ring is hard, convex, and tender to pressure, so that the foetus cannot be palpated. The retraction ring is felt as a marked ridge well over the pubes, and it may even approach the level of the umbilicus. The ridge is more or less transverse in vertex cases (Fig. 78), but with a shoulder presentation the greatest stretching of the lower uterine segment is over the head, so the retraction ring runs obliquely upwards (Fig. 94).

As the lower uterine segment thins the foetus may possibly be more easily palpated below the retraction ring, but in many cases the tenseness and tenderness to palpation make this sign of doubtful value.

It may be possible to palpate the round ligaments as very tense rounded cords in the region of the internal abdominal ring.

*Vaginal Examination.*—The vagina is hot, dry, and tender. The bag of membranes is found ruptured. The presenting



part is felt to be quite immovable and covered with a large caput succedaneum. Further examination shows the presence of an obstruction to labour.

**Treatment of Threatened Rupture.**—Give a hypodermic of morphia gr.  $\frac{1}{3}$  to  $\frac{1}{2}$ , and chloroform the patient to the surgical extent. Wait till the uterus relaxes, as if delivery is attempted while it is in a state of tetanic contraction serious laceration or actual rupture will be caused.

If the child is alive, and delivery by forceps is possible, use them, but if the child is dead, perforate.

Perforate a hydrocephalic head, decapitate in a transverse lie, and perform craniotomy in minor degrees of deformed pelvis.

An impacted ovarian cystoma should be punctured or incised.

Caesarean section is necessary for major degrees of pelvic deformity or such serious obstruction as atresia vaginae or large fibroid in the pelvis which cannot be removed.

**Symptoms and Diagnosis of Actual Rupture.**—The rupture is usually sudden, but it may be gradual and imperceptible.

1. *Sudden Rupture.*—The history before rupture occurs is that described under threatened rupture. The rupture occurs during a contraction, when the patient, in the midst of her intense suffering, has a *severe cutting pain* in the abdomen, and feels as if “something had given way.” This gives *sudden relief* from the severe labour pain, but it is quickly followed by *collapse* and symptoms of shock. The patient is pale, her extremities are cold, and the pulse may be 120, small, quick, and irregular. There is now an *escape of blood* from the vagina. In *complete rupture* the *external bleeding* is rarely profuse, as most of the effused blood is retained as internal haemorrhage, and if much is effused signs of acute anaemia appear, although the visible amount is not great.

With *incomplete rupture*, severe external haemorrhage is not uncommon.

If the foetus remain in the uterus the labour pains continue, but if it escape through the rent the pains cease.

2. The *rupture* may be *gradual* and imperceptible, the symptoms not being so severe, but the appearance of shock and haemorrhage after several hours of severe labour are very suspicious of actual rupture.

3. *Traumatic Rupture*.—Rupture may occur during operative interference (see “Etiology”), and may not be suspected till after the child is delivered, the patient then showing symptoms of collapse, with rapid pulse and haemorrhage.

The tear is oftener incomplete, but if complete the placenta may be found to have passed through the rent into the abdominal cavity.

**Diagnosis**.—The above history of threatened, followed by symptoms of actual rupture are almost diagnostic even although the presence of the presenting part at the brim prevents the rupture being felt.

The presenting part may be found to have receded, which is almost conclusive evidence of rupture.

If the *rupture* is *complete*, and the foetus in whole or part has passed through the rent, then by *abdominal palpation* the foetal parts are felt separate from the hard, retracted, tender uterus. *Vaginal examination* shows that the presenting part is absent, and on passing the fingers into the uterus the tear is felt.

**Differential Diagnosis**.—The condition cannot be mistaken for unavoidable haemorrhage, but might simulate accidental haemorrhage (see p. 247).

In suspicious cases carefully examine for suspected rupture.

**Prognosis**.—It is usually fatal, the mortality being from 75 to 90 per cent., due to shock, haemorrhage, or septic peritonitis.

Perforating rupture is more fatal than incomplete tear, septic peritonitis being the chief cause of death.

Haemorrhage is apt to be more profuse in incomplete tear, but a degree of haemorrhage which would not of itself prove fatal will cause death owing to the accompanying shock.

**Treatment after Rupture**.—1. *Child in the Uterus*.—It should be delivered per vias naturales by methods indicated according to the nature of the obstruction.

If the child is alive, and delivery by forceps is possible, use them, but if the child is dead or hydrocephalic, or the pelvis is deformed, perforate.

Major degrees of pelvic deformity, or absolute obstruction unsuited for craniotomy, require caesarean section in any case.

After the child is delivered, remove the placenta, then carefully douche with sterile saline solution.

If there is no haemorrhage, drain the tear by sterile gauze.



If the tear pass into the broad ligament, douche, and then pack the cavity with sterile gauze.

Instead of merely draining the tear, the whole uterine cavity may be packed with sterile iodoform or bismuth gauze, and this should be done as well as packing the rent if haemorrhage is severe. If this prove sufficient, put a horse-shoe bolster over the fundus, and apply a tight binder to compress the uterus, and then treat the patient for shock and anaemia as below. If haemorrhage persist, although the uterus is packed, laparotomy must be done as below.

2. *The Child has passed through the Tear.*—If the child has partly passed through the rent, no attempts should be made to deliver it by the vagina, as the act of pulling the foetus back through the tear, especially if the uterus has retracted, may enlarge the tear and increase the haemorrhage. Perform laparotomy, and remove the foetus and placenta per abdomen.

*Management of Uterus after Laparotomy.*—If the patient is strong, and all infection of the peritoneal cavity can be excluded, and if the tear is not too ragged and bruised, then the wound may be stitched, the abdomen cleansed and closed. These favourable conditions will, however, rarely be found, as most cases are infected, so laparotomy should be followed by supra-vaginal or total hysterectomy, if the patient's condition will permit this extension of the operation. The indications for hysterectomy are:

1. Patient able to stand the operation.
2. Uterus infected. Most cases are to be regarded as septic.
3. Extensive ragged tear with bruised edges.
4. Severe haemorrhage.

After removing the uterus, the abdomen should be flushed with hot saline, and the pelvis drained through the vagina by gauze packing.

If the patient's condition is too critical to stand hysterectomy, simply pack the rent from above, and drain the pelvis with gauze into the vagina. In addition to this, the tear may be partly stitched if very extensive.

**Treatment of Shock.**—*Shock and loss of blood* should be treated by saline infusions given subcutaneously under the mammae, or intravenously, also by proctoclysis; by hypodermic injection of infundibular extract, ℥ xv, or injections of strychnine, gr.  $\frac{1}{30}$ , repeated at 2 or 4 hourly intervals as indicated by the state

of the pulse; and by packing hot water bottles round the patient.

When the patient recovers from the shock, place her in Fowler's position to facilitate drainage from the lower abdomen.

#### 4. Retained Placenta.

**Definition.**—The placenta is retained because the uterus is unable to separate and expel it:

- (a) from atony of the uterus, *inertia uteri*;
- (b) from hour-glass contraction of the uterus, *strictura uteri*;
- (c) because the placenta is adherent.

##### (a) Retained Placenta from Inertia Uteri.

**Causes.**—For various causes of *inertia uteri* see pp. 176 and 177, but the chief causes are:

1. Constitutional; poorly developed muscle.
2. Prolonged labour; the uterus is exhausted, secondary inertia.
3. Over-distension from twins or hydramnios.
4. Fibroids in the uterine wall.
5. Too rapid delivery and sudden emptying of the uterus by forceps, or after version.
6. Prolonged and deep chloroform narcosis.

**Symptoms.**—There are no pains, as the uterine contractions are feeble or absent.

If no portion of the placenta is detached, there is little or no haemorrhage.

If the placenta is partly detached, there is haemorrhage, which may be very profuse.

The blood may collect in and distend the uterus, and thus be overlooked if the hand is not kept on the uterus during the third stage; or there may be alternate distension of and escape of blood from the uterus when a sufficient quantity collects to excite a contraction.

**Diagnosis.**—The uterus feels soft and flabby, and remains as large as it was immediately after the child was born, the fundus being at or above the level of the umbilicus.

Should blood collect, owing to the blocking of the cervix by clot, the uterus can be much larger, and if it is compressed by the hand there is a sudden gush of the retained blood.



**Prophylaxis.**—This consists in recognizing the causes which may end in inertia, and thus avoiding them earlier in labour, as mentioned in the management of labour and its complications.

**Treatment.**—*No Haemorrhage.*—Gently massage the uterus to stimulate it to contract, and give an injection of ergot. Avoid attempts at forcible expression before it is separated. It is a disputed point how long one should wait before taking the extreme step, and one to be avoided if possible, of manually separating the placenta. The author prefers not to wait longer than one hour, others advise waiting two or three hours. In any case never wait longer than three hours, owing to the risk of sepsis starting.

For method of separating the placenta see obstetric operations.

(b) **Retained Placenta from irregular or hour-glass contraction.**

The uterus is partly retracted and partly flaccid or atonic—*strictura uteri*.

The flaccid area is usually the placental site, the rest of the body being retracted; but the seat of constriction may be the retraction ring. As a result the placenta is retained in the pouch above the constriction—*placenta incarcerata*.

**Cause.**—1. Giving ergot during labour. This is the commonest cause.

2. Protracted labour.

3. Too sudden evacuation of the uterus.

4. Forcible and premature attempts to expel the placenta before it is separated.

**Symptoms.**—Pains are present and may be constant. Haemorrhage is usually slight.

**Diagnosis.**—The uterus is felt flaccid above, harder below. The placenta cannot be expressed, a hand passed into the uterus feels a constriction which will only admit one or two fingers to feel the incarcerated placenta in the pouch beyond.

**Treatment.**—Give a hypodermic of morphia, gr.  $\frac{1}{4}$ , and chloroform the patient. Thoroughly cleanse the vulva and vagina with an antiseptic, also your hands and arms. Wear boiled rubber gloves. Dilate the constriction with the fingers till the hand can be passed, then separate the placenta. Expel

the placenta by compressing the uterus, do not pull it out. Finally, thoroughly douche the uterus with a 1 per cent. lysol solution at 115° F.

### (c) Adherent Placenta.

The placenta is too adherent for the uterus to separate it, so it is retained. The septa in the spongy layer, where separation normally occurs, are tough and fibrous; and the spaces are not so large or numerous.

Cases have been noted where the decidua basalis was almost entirely absent, the villi being in direct contact with the muscular wall of the uterus.

**Cause.**—(1) Decidual endometritis; (2) placental infarcts.

**Symptoms and Diagnosis.**—1. *Entirely adherent.*—There is no bleeding, and the uterus is well retracted and hard. You wait an hour, and as expression fails, the hand is passed into the uterus and notes the condition.

2. *Partially adherent.*—The bleeding may be severe, especially if the detached portion is below. Suspect the condition if the uterus is well retracted and there are no tears to account for the bleeding.

**Treatment.**—1. *No bleeding.*—Pass the hand into the uterus and separate the placenta if expression fails after waiting one hour.

2. *Bleeding profuse.*—Try expression, and if this fail separate at once. As pieces are left behind, if firmly adherent, watch carefully during the puerperium, owing to the increased risk of sepsis, and douche the uterus daily, if required.

### 5. Factors controlling Haemorrhage after Labour.

Haemorrhage from the torn utero-placental blood vessels is naturally arrested by the following factors:

1. In the last months of pregnancy there is blocking of many of the sinuses in the uterine wall below the placental site, and also of the veins in the decidua basalis.

2. When the uterus retracts the muscular fibres compress the curling arteries, slanting veins and sinuses, thus kinking and closing them.

3. The blood-vessel walls shrink or contract.

4. Thrombi form in the vessels and sinuses and plug them.



5. The anterior and posterior walls of the uterus come into close apposition and press on each other.

6. The uterus sinks into the pelvis where it is compressed, while the vessels entering and leaving the uterus are compressed between the uterus itself and pelvic wall (ball-plug action). In treating post-partum haemorrhage we endeavour to bring about the conditions 2 to 6.

### 6. Post-Partum Haemorrhage.

*Definition.*—Haemorrhage from uterine cavity—placental site—coming on within six hours after the birth of the placenta.

*Cause.*—Whatever the other cause may be, atony is usually present as well.

1. *Uterine inertia* from (a) protracted labour, over-distension, too sudden emptying of uterus, prolonged anaesthesia and other causes mentioned, p. 177; (b) mismanagement of the placental stage, especially early forcible expression of the placenta.

2. *Conditions interfering with retraction:* (a) retained portions of placenta, membranes or blood-clot; (b) fibroid or other tumours of uterus; (c) peritonitic adhesions.

3. *Conditions interfering with the formation of thrombi:* (a) rising out of bed, coughing, straining; (b) constitutional diseases, e.g. haemophilia, chronic nephritis.

4. *Conditions preventing the uterus sinking into the pelvic cavity to compress the blood vessels:* (a) deformed pelvis; (b) full bladder; (c) ovarian or other tumour.

5. *Placenta Praevia*; lower uterine segment very vascular.

**Symptoms and Signs.**—The blood escapes from the uterus in gushes, or is continuous. Most of the blood escapes, but if the atonic flabby uterus distends, the blood collects and is concealed. If the haemorrhage is profuse and the amount of blood lost is great, the patient rapidly shows the signs of acute anaemia.

Palpation of the uterus shows that it is soft and flabby, with the fundus high up. If it is distended with blood it is correspondingly enlarged, and when compressed the retained blood is expelled with a sudden gush.

**Differential Diagnosis.**—Exclude haemorrhage coming from tears of the cervix, vagina or vulva in the region of the vestibule, also from ruptured varicose veins of vagina or vulva, or from a ruptured haematoma. The uterus is felt well

retracted, unless by chance it should be atonic as well, and the source of the haemorrhage is seen. Tears of the cervix are felt, and are deep into the fornix, to produce profuse haemorrhage.

**Prognosis.**—If not checked, post-partum haemorrhage can prove rapidly fatal, and the danger is all the greater if the patient has already lost blood during labour before the placenta was born.

If the patient recover, convalescence is slow, depending on the acuteness of the anaemia, and, as her resisting power is diminished, she runs a greater risk of septicaemia and phlegmasia alba dolens.

**Prophylaxis.**—If there is a history of previous liability to post-partum haemorrhage, the coagulability of the blood should be improved by giving calcium lactate, gr. xv, thrice daily for several weeks before labour is due. Iron tonics should also be given to anaemic women. *During labour* avoid all causes likely to cause inertia. *Prevent* the labour being too *prolonged* during the second stage, to guard against secondary inertia. In *aiding delivery* during the second stage *do not empty* the uterus too quickly. During the *third stage* keep the *hand* on the *uterus*, not only till the placenta is expelled but until the uterus is felt to be well retracted.

*Never hurry the placental stage*, and remember that early forcible expression of the placenta is dangerous.

Examine the placenta and see that it is entire and none left in the uterus. A portion of a placenta succenturiata may easily be overlooked and left behind. The missing portion may be recognized by a defect in the membranes, or by the presence in the membranes of the torn blood vessels, which originally passed from the cord to the detached lobules. This is best recognized by holding up the membranes against the light.

If disposed to atony, give a full dose of ergot hypodermically as soon as the placenta is expelled, or even during the third stage.

Over-distension of the bladder interferes with the retraction of the uterus, so see that the bladder is kept empty during labour.

If the pulse keep fast after labour, be on the watch for haemorrhage.



**Treatment.**—1. *Grasp the uterus*, express all blood clot, then compress and massage it, and press it into the pelvis.

2. If this does not at once control it, quickly put on a sterile rubber glove, *explore the uterus* to remove any retained portion of placenta or clot, then *bimanually compress* it between the outer hand placed over the fundus, forcing it down into a position of anteversion, and the inner fist placed in the posterior fornix to press the cervix upwards and forwards. Another good method is to grasp the cervix with the fingers and thumb, and with the outer hand on the fundus the uterus is squeezed together.

3. While the uterus is being compressed, get an assistant to inject deep into the nates ℥x of standardized *ergot* or *ernutin*. *Ergot per os* takes too long to act. *Pituitary* (infundibular) extract ℥xv, also acts quickly and well.

4. Next have a *hot douche* prepared of sterile saline or half per cent. lysol, the temperature of which must not be less than  $115^{\circ}$  to  $120^{\circ}$  F. About four quarts usually suffice. Douche the vagina, then pass the running intra-uterine catheter through the cervix up to the fundus, and let a slow stream pass through for ten or fifteen minutes by holding the douche can not more than two to three feet above the level of the patient.

5. Should the above fail, and this is rare if the treatment has been promptly begun and properly carried out, *tampon* the *whole uterine cavity* with sterilized gauze, and plug the vagina. Take four to six yards of gauze, four layers thick, and about four inches wide. Fix the fundus uteri, with the outer hand, and make sure that the gauze is packed right up to the fundus. When the uterus is full, plug the vagina with walnut-sized pledgets of cotton wadding wrung out of a weak antiseptic.

The whole procedure must be carried out aseptically, as if germs are carried in with the gauze, and it may easily be infected with the *bacillus coli* from trailing over the anal region, a fatal sepsis may easily result.

*Never plug* the vagina alone, as the patient will bleed to death by the blood collecting inside her own uterus above the plug.

6. *Styptic.*—The uterine cavity may be swabbed with 1 in 1000 adrenalin, or the gauze used to pack the uterus may be moistened in it.

Synthetic suprarenin hydrochloric, 1 in 1000, may be used, as it seems to act as well as the extract.

Neu recommends the injection of 1 in 10,000 adrenalin into the atonic uterine muscle.

**Emergency Treatment of Alarming Haemorrhage, the Patient being already Acutely Anaemic when seen.**

The condition is urgent, and there is no use wasting time trying to get an inert uterus to contract when it cannot. At once grasp the uterus with one hand, pass the other hand into the vagina, clear out all clot from the uterus, then *bimanually compress* the uterus and *continue to do so* till the patient rallies and uterus retracts. As soon as the bleeding is controlled by bimanual compression, instruct an assistant what to do to rally the patient as follows, while you still compress the uterus: The patient lies flat on her back with no pillow. The foot of the bed is raised, or the pelvis elevated by pillows. Raise the limbs and bandage them from below upwards (autotransfusion). Tear a sheet into bandages for this purpose if necessary. Give brandy,  $\bar{3}$ ss, and saline,  $\bar{3}$ x, per rectum till the patient can swallow, when fluids are given by the mouth. The assistant can now inject ernutin or ergot and strychnine, gr.  $\frac{1}{30}$ , into the nates. When patient has rallied, and the uterus is retracted, slowly remove the bandages from the limbs, one at a time, carefully noting the effect. Finally give a prolonged hot intra-uterine douche, 115°-120° F. If a skilled assistant is at hand the autotransfusion need only be adopted until a saline can be prepared for hypodermoclysis or for infusion into a vein.

*Alternative Methods for emergency control of Haemorrhage.—*

1. *Compression of Aorta.*—At once compress the aorta with the ulnar side of the clenched left fist against the lower lumbar vertebrae. Slide the hand upwards or downwards at short intervals to prevent too prolonged pressure being exerted on one spot only. Use other measures as above to rally the patient. When the patient has rallied, release the aorta, clear out the blood-clot from the uterus, and bimanually compress the uterus till it is well retracted. Finally, douche the uterus as above.

2. *Momberg's Compression of the Aorta.*—This should only be done in severe cases, as the method is not free from danger and may be followed by collapse. It is also unlikely to find



favour in general practice, as the necessary elastic tubing will not be at hand when wanted. Besides, severe cases of post-partum haemorrhage are rare in a well-conducted midwifery practice.

An elastic rubber tube, finger thick, and about five feet long, is wound two to four times round the body, about the level of the umbilicus. It is applied just tight enough to stop the pulsations in the femorals, and the constriction is continued up to thirty minutes.

If the patient is placed in the Trendelenburg position when applying the tube, it will avoid compression of the superior mesenteric, which causes bad symptoms.

The tube must be removed slowly to avoid a sudden change in the blood pressure.

**After-treatment.**—Keep the patient absolutely quiet, lying flat on her back, with the head low and the foot of the bed raised. Carefully watch and keep the hand on the fundus uteri till it remains well retracted. Sit beside the patient for two or three hours if need be, with the hand on the uterus, and gently rub it from time to time. Another injection of ergot may also be given.

## 7. Symptoms and Treatment of Acute Anaemia from Haemorrhage during or after Labour.

**Symptoms.**—Increasing pallor of body and mucous membrane of lips; coldness of extremities; rapid, small, easily compressible pulse, rising to 140 or more as anaemia gets more acute; faintness; it may be nausea and vomiting; sounding noises in ears; flashing before eyes; increasing thirst; intense weakness; sighing respiration with a feeling of restlessness and anxiety. As the case gets worse there is more rapid breathing; cold sweats; the radial pulse disappears, and consciousness is lost. Respiration becomes shallow and irregular and then stops, the heart beating a short time longer.

**Treatment.**—The patient lies on her back, with head low. Raise the foot of the bed. If the bed is fixed raise the pelvis by pillows. If she can swallow, give frequent small quantities hot milk, beef tea, meat juice; brandy or whisky. In urgent cases, or if the patient can't swallow, feed per rectum, giving brandy  $\bar{3}$ ss in  $\bar{3}$ vi-viii saline solution. Give hypodermics of ether, strychnine, gr.  $\frac{1}{30}$ , digitalin, gr.  $\frac{1}{100}$ , and place hot bottles round the patient to maintain warmth.

*Autotransfusion.*—This is useful in an emergency till other remedies can be got ready. Raise the limbs, rub and then bandage them from below upwards, then lower them. The method is painful and not free from danger, as embolism has resulted.

*Saline Injections or Infusions.*—(1) *Rectal.* Frequent enemata of 6 to 10 ounces 0·6 per cent. saline solution, *i.e.* 1 teaspoonful sodium chloride to 1 pint boiled sterilized water at 104° F., as it cools in running through the syringe. (2) *Mediate* or *hypodermoclysis.* Münchmeyer's method. Require trocar, 4 feet long rubber tubing, and metal or glass funnel, all easily sterilized by boiling. Solution is 0·6 per cent. salt at 103° F. (It is convenient to use tabloids or sterile tubes of special salts or special concentrated sterile solutions.) Inject 1 to 2 pints by the trocar inserted into the cellular tissue below the mammae. From 1 to 2 pints can be absorbed in twenty minutes. (3) *Direct into* median basilic vein by means of a special cannula at 103° F. From 1 to 2 pints are slowly allowed to run in, the effect on the pulse being noted.

### 8. Inversion of Uterus.

This is now rare, owing to more judicious management, especially of the third stage of labour.

The uterus may invert during the placental stage or just after the placenta is born—post-partum inversion.

The **varieties** are—

I. *Partial.*—(a) A cup-shaped depression of the fundus into the uterine cavity.

(b) The depressed fundus lies within the cervical canal or is partly in the vagina.

II. *Complete.*—(a) The whole uterus as far as the cervix is turned inside out and lies in the vagina, and the fundus may even protrude through the vulva. The cervix forms a collar or ring round the pedicle or base of the inverted uterine body.

(b) More rarely the whole uterus inverts as far as the os externum, so that the base of the inverted uterus seems to rise directly from the vaginal vault.

**Cause.**—(a) *Induced.*—1. Pulling on the cord; or

2. undue pressure on the fundus in trying to deliver the placenta.

(b) *Spontaneous.*—1. The whole uterus is flaccid and atonic, and inverts without contraction from below upwards.



2. Part of the wall, usually the placental site, is flaccid and is forced down through the cervix into the vagina by the rest of the uterus contracting. This is more liable to occur with a fundal attachment of the placenta.

3. Traction of a very short cord during labour pulling on the uterine wall through the placenta.

**Pathology.**—*Complete.*—In the *third stage* the everted mass is smooth, being covered by the placenta and membranes, or the placenta may be partially detached.

If *post-partum*, the surface of the inverted uterus is irregular and raw-looking, with clots lying in the sinuses. The mass is soft, and is grasped at the base by the cervix, which is rarely completely everted.

Exceptionally, the cervix is also completely everted, so that the vaginal vault is continuous with the everted uterus.

**Symptoms.**—There may be only haemorrhage in slight inversion.

In the more complete form there is haemorrhage, bearing-down pain, severe shock and collapse. Severe pain is present in the partial form if uterine contractions are present. Pain is less severe, and occasionally absent, in the complete form.

**Diagnosis.**—*Palpation of Abdomen.* *Partial.*—Feel a depression at the fundus uteri. *Complete.*—The lower abdomen is empty, and no uterus is to be felt.

*Vaginal and Bimanual Examination.* *Partial.*—Feel a soft globular mass projecting into the uterine cavity, and bimanually note a deep depression in the fundus uteri.

*Complete.*—A soft globular mass is felt projecting through the cervix into the vagina, with the fundus at or projecting through the vulva. If the placenta is still attached, it is easily recognized, and the mass is so much larger. If *post-partum*, the characteristic rough surface of the placental site can be seen and felt.

On passing the fingers up to the vaginal vault, the cervix is felt surrounding and grasping the base of the everted mass. Should the cervix be everted as well, the base of the mass and the wall of the vaginal vault are continuous; there is no cervical collar.

By *bimanual examination*, there is an entire absence of any tumour in the lower abdomen as representing the normal situation of the large uterus so easily palpable after labour.

**Prognosis.**—This is very grave from shock, haemorrhage and sepsis. If not reduced, the uterus may become gangrenous and lead to peritonitis. If the patient survive, it may become a chronic inversion. The uterus can usually be replaced if done at once, but if it is neglected, or replacement fails, an operation may be necessary after involution is completed.

**Treatment.**—Chloroform the patient. Thoroughly cleanse the vulva and vagina, and observe the strictest asepsis. Push up the inversion, applying counter pressure with the other hand on the abdomen. First push up the part nearest the cervix, and gradually work along the wall till the fundus is reduced last of all. If the placenta is adherent, do not remove it till the inversion is reduced, but if the placenta prevent the reduction, or is already mostly detached, then remove it first.

After reduction is completed, antiseptically douche the uterus at 115° F., and should the uterus remain atonic, tampon the utero-vaginal canal with gauze for twenty-four hours, as it may invert again. The patient must then be treated for the severe shock and collapse by hot bottles, hypodermics of strychnine, rectal enemata of saline and brandy, and infusions of saline, by hypodermoclysis under the mamma, or intravenously.

If reduction fails, and this is only likely to occur in cases not seen for some days later, it is better to wait till involution is complete, meantime guarding against sepsis by antiseptic vaginal douches, and protection of the vulva by sterile pads.

For later treatment see a gynaecological text-book.

### 9. Lacerations of Cervix.

Tear of the cervix may be perforating or non-perforating.

(a) *Perforating Tear.*—This tear involves not only the vaginal portion of the cervix, but extends upwards to open into the abdominal cavity. It may, however, arise from a downward extension of a rupture of the uterus.

**Cause.**—1. Continuation of a rupture of the uterus downwards through the cervix.

2. Forcible and improper use of metal branched dilators.

3. Improper use of forceps before the cervix is fully dilated.

4. *Accouchement forcé.* Attempted rapid and forcible delivery with an undilated cervix.



**Treatment.**—If due to extension of the tear of a ruptured uterus, the treatment is that of rupture of the uterus, the symptoms and diagnosis being the same.

If due to the other causes mentioned, pack sterilized gauze into the tear to drain, or, if necessary for haemorrhage, tampon the whole utero-vaginal canal.

(b) *Non-Perforating Tears.*—These tears may be of any extent, from a slight laceration, which is usual in most labours, up to tears which extend into the fornix, or even into the parametrium, where the vaginal branch of the uterine artery may be torn, causing profuse haemorrhage. The tears are usually lateral, and may be on one or both sides, completely splitting the cervix up to the lateral fornices. More rarely, extensive tears occur, splitting the anterior or posterior lip in the middle line, usually in addition to the lateral tears.

**Causes.**—1. The most frequent cause is the foetal head itself, and it is more liable to occur if the membranes rupture prematurely, or if there are malpositions or malpresentations.

2. A rigid cervix is more liable to tear, and the laceration may extend into the fornix without any interference.

3. Forcible dilatation of the cervix by fingers or dilators.

4. Improper use of forceps before the cervix is dilated.

5. *Accouchement forcé.*

6. Rapid delivery of the after-coming head in a breech case.

**Symptoms.**—If there is no haemorrhage, tears, even if extensive, will pass unnoticed.

If haemorrhage occur, due to the tear being so extensive as to involve a branch of the uterine artery, and if the tear occur before the head has begun to descend, as may happen if the cause is forcible dilatation of the cervix, the blood will escape externally early in the second stage.

If, on the other hand, the head has descended far enough to plug the seat of laceration, or if the severe tear is caused by the foetal head during its passage through the cervix, the haemorrhage appears externally as soon as the child is born.

**Diagnosis.**—The uterus is well retracted, and examination excludes both the vestibule and vagina as the source of the bleeding. The cervix is then examined, and the tear felt.

**Prognosis.**—If the wound is aseptic, it may heal, leaving a

cicatrix in the fornix, but the lips of the vaginal portion of the cervix do not unite and remain gaping up to the fornices, giving rise to future gynaecological trouble.

If the wound become infected, it readily gives rise to puerperal cellulitis in the broad ligament.

**Treatment.**—Severe lacerations ought to be sutured, the suturing being done under the strictest antiseptic and aseptic precautions. Place the patient on a table or across the bed in the lithotomy position, the limbs being supported by an assistant or placed over the backs of two chairs. Pull down the cervix to the vulva with volsella applied one to each lip, and accurately unite the tear with interrupted silk-worm or chromicized catgut. The sutures should be carried well into the angle of the tear to make certain that all bleeding is controlled.

Should the haemorrhage be slight, or should the physician not be in a position to suture, try the effect of a hot douche at 115° to 120° F., then pack the region of the tear above and below with sterile gauze and tampon the vagina. Finally, when the haemorrhage is controlled, apply a horse-shoe bolster over the fundus, kept in place by a tightly-fixed binder, so as to fix down the uterus and compress it.

A horse-shoe bolster is made by rolling a long pad of wadding in a towel which is bent round in the shape of a horse-shoe, and is applied over the fundus and down the sides of the uterus so as to encircle it from above.

If tamponade is done for severe haemorrhage, the patient must be carefully watched and the size of the uterus kept under constant observation, to make sure that the haemorrhage is not finding its way into the uterus and distending it above the packing.

#### 10. Laceration of Vagina.

(a) *Perforating Tear.*—A laceration in the upper part of the vagina may pass into the abdominal cavity.

**Cause.**—As in perforating tear of the cervix. Such a severe tear has also been caused by forcing a blade of the forceps through the posterior fornix.

**Treatment.**—Drain, and pack with sterile gauze.

(b) *Lacerations of Lower Half of Vagina.*—Slight tears usually pass unnoticed, unless discovered accidentally.



The most usual tears are those associated with rupture of the perineum, and are longitudinal, passing up in one or both vaginal sulci, on either side of the posterior column, so that, although the perineal tear is central, the vaginal tear passes up a little to the side and slightly obliquely.

**Cause.**—1. Over-stretching of the vagina, and specially liable to occur in elderly primiparae.

2. Deep cuts may be caused by projecting splinters of bones during delivery of a head which has been perforated.

**Symptoms.**—Bleeding is not severe unless the tear is deep and large.

**Prognosis.**—The tears only heal by granulation, and, if associated with rupture of the perineum, they gape and cause permanent relaxed vaginal outlet.

**Treatment.**—Bleeding tears high up should be sutured, but as this cannot be done without assistance, and the aid of specula to expose the part, the vagina should be tightly packed with gauze or wool tampons, and the suturing done within twelve hours if possible. Tears at the outlet are easily seen and reached by placing the patient in the lithotomy position, and should in all cases be sutured at once, whether bleeding or not (see “Rupture of Perineum”).

### 11. Tears of Vulva.

Tears in the region of the vestibule or clitoris can cause serious and dangerous bleeding, so this part of the vulva should always be carefully examined when haemorrhage occurs after labour.

**Treatment.**—These tears must be sutured at once, and a round needle used, as the needle-pricks bleed readily. A *deep* grip of the tissues should also be taken, otherwise the suture readily cuts through the soft tissue when tying.

If the needle-wounds still bleed after the sutures are tied, apply a pad to compress the region, and tie the thighs together.

### 12. Rupture or Tear of Perineum.

Tears of the perineum may be partial or complete.

The tear is seen to begin at the frenulum as the perineum is reaching its maximum distension during birth of the head, and to extend backwards in the middle line.

If extensive, the tear passes up into one or both vaginal sulci (see "Tears of Vagina"), and may also involve one or both labia majora.

*Partial or Incomplete Tear.*—Any tear, however extensive, which does not involve the sphincter ani, and does not open into the anus, is called partial or incomplete.

Sometimes the laceration is subcutaneous, the perineal muscles being ruptured, but the skin remaining intact.

A rare form is the *central tear*, the perineum rupturing in the middle, while the commissure in front remains intact.

*Complete.*—The tear extends through the sphincter ani into the anus, so that the ano-vaginal septum is completely split.

**Cause.**—1. *Mother.*—(a) Narrow vagina, (b) rigid perineum, (c) flat pelvis, (d) narrow pubic arch.

2. *Child.*—(a) Large head, (b) occipito-posterior or brow case, (c) wide shoulders, (d) precipitate labour.

3. *Physician.*—(a) Too rapid delivery with forceps, (b) performing version, (c) delivering after-coming head.

**Symptoms.**—There are none, unless the vagina or vulva are torn as well, causing haemorrhage.

**Diagnosis.**—If the perineum is being watched while it is being supported during birth of the head, a tear can be seen beginning anteriorly and extending backwards.

Tears should always be looked for after every labour, and this should be specially remembered should the child have been born before arrival of the physician.

When examining for tears, place the patient in the dorsal position in a good light and carefully note their extent, and how far the vagina is involved.

**Prognosis.**—All tears gape, due to the action of the transverse perineal muscles, and will not close unless sutured, so that it is quite useless to tie the legs in the hope that the wound will unite.

All tears should be sutured, otherwise they heal by granulation, and leave a permanent relaxed outlet, which favours cystocele, rectocele, prolapsus uteri, and various other gynaecological conditions. They also become easily infected, to form a puerperal ulcer, from which sepsis may spread upwards to the uterus by contamination of the lochia, with consequent risk of septicaemia.



If the tear involve the sphincter ani and anus, there is a permanent incontinence of liquid faeces and flatus, causing great misery and mental distress, especially to refined women.

**Treatment.**—The perineum should be sutured immediately labour is ended, but should the condition of the patient prevent this, it may be postponed for several hours, preferably not more than twelve, though successful suturing may result if delayed for even longer.

The wound should never be sutured with the patient lying on her side, as it is impossible to apply the stitches properly in this position, and as the tear, unless slight, always involves more or less of the vagina, the vaginal portion can only be sutured in a surgically correct manner with the patient in the dorsal position.

Place the patient on her back in the cross or oblique bed position in a good light, and, if there is no assistant to help, the legs can be placed over the backs of two chairs, or one leg if the oblique bed position is used. The wound should not be touched except to swab it clean with sterile swabs wet with sterile saline solution, or, failing these, swabs of wadding soaked and wrung dry out of a weak antiseptic lotion. The hands must be thoroughly cleansed, and all instruments boiled. Interrupted silk-worm gut sutures, or chromicized or iodized catgut, should be used, and they should not be tied too tightly, as the tissues become oedematous after labour. All that is necessary is accurate coaptation of the whole wound, and taking care to pass the sutures completely round the wound, so that no pockets are left in which blood collects. Such blood-filled pockets readily become septic, leading to breaking down of the whole wound, infection of lochia, and sepsis.

*Incomplete Tear.*—First pass those sutures from the vaginal aspect which are required to close the vaginal portion, and it is better to leave them untied until the perineal sutures are passed, this being easier done with the wound gaping. When all the sutures are passed, swab the wound dry, and quickly tie each one, beginning with the top vaginal suture.

*Complete Tear.*—First accurately close the bowel with interrupted sutures of No. 2 catgut knotted on the anal side, and passed close to the edge of the anal mucosa, and be sure to bring the torn ends of the sphincter ani into accurate apposition. The rupture is now converted into an incomplete tear,

which is sutured in the same manner as above, using preferably silkworm gut.

**After-treatment.**—It is only necessary to keep the parts clean and dry, and dust the wound with an antiseptic powder. The sutures are removed on the tenth day if silkworm gut has been used.

Give a full dose of castor oil on the evening of the third day, so that the bowels may be moved on the morning of the fourth, and this applies also to complete tears. See that the bowels are moved daily thereafter by giving laxatives if required.

Unless absolutely necessary do not use a catheter.

Keep the patient in bed for two weeks, and tell her to be careful for another week. If the patient complain of pain and tenderness in the wound it generally means that it is not healing, and if examination show that there is suppuration and gaping, remove all the sutures, cleanse the wound and dust with powder. In this case wait till the wound is completely healed, and repair at a later date by the operation of colpoperineoplasty as described in gynaecological text-books. It is not advisable to attempt getting union during the puerperium by a secondary operation, such as scraping away the granulations, refreshing the surfaces, and resuturing. Such a secondary operation is not satisfactory, and is very liable to fail. It has also no advantages over a later colpoperineoplasty.

### 13. Eclampsia or Puerperal Convulsions.

**Frequency.**—1 in 300 to 500 cases according to different statistics.

**Definition.**—Epileptiform convulsions associated with defective renal action depending on an auto-intoxication caused by the absorption into the maternal blood from the foetal placenta of certain toxic substances, the products of the disintegration of protein.

**Cause.**—The condition most usually occurs in primiparae, especially if elderly, but it may be seen at all ages, as the author has treated a young primipara, aged 16, for eclampsia during labour, and an elderly primipara, aged 42, at the seventh month of pregnancy.

Eclampsia may also occur in multiparae, but there is usually overdistension of the uterus from plural pregnancy or hydramnios.



Many theories have been promulgated in the past to account for eclampsia, and almost every year some new theory is given forth, only to be disproved the next. It is, however, now recognized that it is a toxæmia depending on pregnancy, and that the toxin causes the fits, and produces marked pathological changes in the kidneys and liver.

As far as is at present known the poison is elaborated in the foetal portion of the placenta, from which ferments and autolytic products pass into the maternal circulation, the principal effect of which is increased coagulability of the blood and the activation of autolytic ferments in other parts of the body. Placental extracts got from placentæ, whether of normal or eclamptic patients, have no special toxicity, but if rapidly injected into dogs cause coagulation of the blood and death from extensive thrombosis.

**Pathology.**—The changes in the kidneys and liver are described under “Pregnancy Kidney” (p. 105). In addition to these, cases examined after death show anaemia, more rarely hyperaemia of the brain, and sometimes hæmorrhages due to convulsions, oedema of the lungs, and multiple thrombosis in different organs.

**Symptoms.**—Eclampsia most usually shows itself in late pregnancy, during, or immediately after labour, in about the following percentages:

- |  |              |
|--|--------------|
| 1. At the seventh month or end of pregnancy, | 20 per cent. |
| 2. During labour, - - - - -                  | 60 „         |
| 3. During the first few hours of the puer-   |              |
| perium, rarely later, - - - - -              | 20 „         |

Most cases have premonitory symptoms, but an attack may develop quite suddenly in a pregnant woman apparently in previous good health.

In some cases, usually seen shortly after labour, the first symptom is coma, the fits beginning later. There have been no premonitory symptoms, but if the urine is examined when the coma begins it is found highly albuminous, and contains tube casts. Coma and albuminuria without fits have also been observed, the post-mortem findings being characteristic of eclampsia.

Although practically all cases of eclampsia show deficient secretion of a highly albuminous urine, a few rare cases are recorded in which no albumen was found in the urine.

Convulsions may occur in a patient with chronic nephritis, but these are probably uraemic.

*A. Premonitory Symptoms.—Pre-Eclamptic State.*—There are frequently prodromal symptoms for days or weeks preceding an attack; and some or many of the following may occur: (a) Headache; (b) eye symptoms, *e.g.* diplopia, amaurosis; (c) ear symptoms, *e.g.* buzzing, deafness; (d) puffiness of eyelids and oedema of feet and legs; (e) epigastric pain, or pain between the shoulders, with nausea and vomiting; (f) albuminuria, tube casts, deficient urea, and the urine just before or after the onset may contain blood. There is also a diminished excretion of urine, which may amount to total suppression during the seizure.

*B. Symptoms of Eclamptic Seizure or Fit.*—Tonic and clonic spasms, with loss of consciousness, like an epileptic fit, but there is no aura nor cry. Usually the onset is sudden, and three stages are recognized as follows:

1. *Stage of Invasion.*—Lasts about one minute. There are fibrillary twitchings of the face muscles and limbs, especially the arms, the fingers being frequently clenched; rolling of the eyes, and the pupils become insensible to light.

2. *Tonic Spasm.*—Lasts ten to twenty seconds. The spasm begins with the face muscles, spreads to the trunk and limbs, and may even cause opisthotonus. The eyes are fixed, and the pupils dilated. The face at first pale, becomes livid from tonic spasm of the respiratory muscles.

3. *Clonic Spasms.*—This stage lasts one-half to two minutes, rarely longer. The spasms begin in the face, and spread to the neck and limbs. There is twitching of the face muscles, with slow movements of the eyes or conjugate deviation. The pupils do *not* react to light. Spasmodic movements of the trunk and limbs last throughout the whole stage. The tongue is often bitten, there is foaming at the mouth, and stertorous breathing. Urine and faeces may be voided. The muscular contractions become weaker as the fit draws to an end, the breathing gets regular, and consciousness gradually returns, but the patient feels drowsy, complains of headache or aching of the muscles, and does not know what has happened. Further fits occur at varying intervals until the patient may become comatose between the seizures, and continue so till death, unless recovery take place. The number of fits which a patient may have



varies within wide limits, from a few up to 50 or 100, or even 207, as in a case recorded by Jardine, which recovered. The fits recur every hour or half hour, or even oftener in serious cases.

As the case progresses the pulse becomes small, hard and rapid, and reaches 110 or 120. The temperature also begins to rise, and, after several fits occur, in severe cases may reach 104° F. The urine withdrawn by catheter is very scanty, highly albuminous, so that it turns solid on boiling, contains tube casts, and is often blood-stained. The urea is low, and the ammonia coefficient high.

Not infrequently the patient has disturbance of vision, usually due to albuminuric retinitis.

**Differential Diagnosis.**—1. *Hysteria*.—The attacks of *early* pregnancy are usually hysterical, but, on the other hand, hysteria is very rare during labour. The examination of the eyes is very important, as if the pupils *react* to light it at once *excludes* eclampsia or epilepsy. There is also no albumen in the urine.

2. *Epilepsy*.—It is most unlikely that epilepsy will only show itself for the first time during late pregnancy or labour, and there will usually be a history of previous fits. An epileptic seizure is also exceedingly rare during labour. There is usually an aura and only *one* fit, whereas in eclampsia the fits are almost invariably multiple. There is also no albuminuria.

3. *Coma*.—Coma, due to alcohol, opium, or apoplexy, can be excluded by the history of the case, examination of the patient, and absence of scanty albuminous urine. Copious albumen in the urine points to eclampsia.

**Prognosis for Mother.**—The severity of eclampsia does not necessarily depend on the number of the fits, as fatal results may occur in cases with only a few fits, whereas recovery may take place after 207, as in Jardine's historical case.

The prognosis is always grave, as the mortality is from 20 to 30 per cent.

The *following conditions* render the prognosis *more grave*:

1. If it occur during pregnancy or the puerperium.
2. The earlier in labour the fits begin, the worse is it both for mother and foetus.
3. The more rapid and the smaller the pulse, the worse is the case.

4. A continued rise of temperature is grave.

5. If the coma become continuous, the case is serious, while comatose cases, with almost complete suppression of urine, may die after two or three fits.

6. The prognosis is very bad if the fits do not cease after the uterus is emptied.

*Causes of Death.*—Death is due to (a) asphyxia; (b) exhaustion; (c) oedema of the lungs; (d) coma; (e) complete suppression of urine; (f) cerebral apoplexy.

*Cases that recover.*—The fits in the majority of cases that recover cease at once after the uterus is emptied, or soon after, but full consciousness is slow in returning, in one of the author's cases not till the tenth day.

The amount of urine soon increases, while the albumen diminishes and disappears, unless the kidneys remain permanently damaged.

After recovery takes place the patient may show mental disturbance, amaurosis, aphasia, or hemiplegia from cerebral haemorrhage.

*Effect on Pregnancy.*—Attacks during pregnancy often bring on labour: if during labour, frequently hasten it.

*Prognosis for Child.*—The foetal mortality is from 30 to 50 per cent., due to (a) asphyxia from intra-uterine toxæmia or placental disease; (b) prematurity and debility; (c) injuries received during labour in effecting rapid delivery for the mother's sake. Foetal death may occur after the first two or three fits, the toxin passing from the mother to the child proving rapidly fatal. The foetal internal organs show the same characteristic changes as in the mother.

*Prophylaxis in Threatened Cases.*—See treatment of "Albuminuria," p. 105.

*Treatment.*—The views held as to the correct line of treatment are so contradictory that they serve to raise confusion in the student's mind. While some give chloroform or morphia, others condemn the use of these drugs. Many now recommend rapid delivery to empty the uterus. Others strongly condemn this procedure, and advise that labour should be allowed to go on naturally, while others hold that the results are just as good with the one as with the other.

*Eclampsia during Pregnancy.*—If treatment of the convulsions prove of no avail, and the fits continue, the uterus should be



emptied as speedily as possible, in the view that if the toxin is elaborated in the placenta, the sooner it is away the better. Labour should be induced by careful dilatation of the cervix with one of the metallic dilators, such as Bossi's or Frommer's. If the cervix is closed and rigid, special care must be exercised, as the use of a dilator is most dangerous under these conditions. When the cervix is dilated, forceps are applied. As foetal death often occurs after two or three fits, the heart should be auscultated, and if there is reason to assume that the child is dead, craniotomy should be performed, as dilatation of the cervix to the full extent is not then necessary. With eclampsia the mother is the first consideration.

Caesarean section is best for grave cases if the cervix is closed and rigid, but this is an operation for the expert in hospital, and is not suitable for the general practitioner working alone. For treatment of the convulsions, see below.

*Eclampsia during Labour.*—The uterus should be emptied as soon as possible by aiding dilatation of the cervix and application of forceps. The expert may consider the advisability of vaginal caesarean section. Some advise that labour should be allowed to proceed and end naturally while the eclampsia is being treated as detailed below.

*Treatment of Eclampsia*, whether occurring during pregnancy, labour, or the puerperium :

1. *During the Fit.*—Nothing can be done beyond protecting the patient from injury, and saving the tongue from being bitten by placing a folded cloth between her teeth.

2. *Remedies to control Recurrence of Fits.*—(a) *Chloroform.*—Inhalations by a mask are given during the intervals. Many hold chloroform to be dangerous owing to its toxic action on the liver, and therefore to be absolutely avoided, since the toxin of eclampsia also affects the liver.

(b) *Chloral.*—Give  $\frac{1}{2}$  drachm, repeated at intervals of three hours, till  $1\frac{1}{2}$  drachms are given. If the patient cannot swallow, it should be given per rectum after the bowel has been emptied by an enema. Bromides may be combined with the chloral as an additional sedative.

(c) *Morphia.*—Some prefer morphia, injected hypodermically, to chloral, giving gr.  $\frac{1}{2}$ , followed in two or more hours by gr.  $\frac{1}{4}$  if required.

The author is in agreement with those who avoid the use of

morphia, as it checks the excretion of urine and the elimination of the toxin, besides counteracting the very beneficial effects of saline infusions. It is also dangerous to the foetus.

(d) *Tinct. Veratri Viridis*.—℥ x to xx are given hypodermically, ℥ x being repeated in half an hour if necessary, the object being to slow the pulse to below 100.

(e) *Thyroid and parathyroid preparations* have been recommended as being substances which will overcome the vasoconstriction of the renal vessels.

3. *Methods to Eliminate the Toxin*.—(a) *Purgation*.—Empty the lower bowel by an enema. If the patient can swallow, large doses of magnesium sulphate are given by the mouth, but, if unable to swallow, pass a tube into the stomach, and pour in from two to four tablespoonfuls well diluted. Croton oil ℥ij in one drachm of glycerine placed on the back of the tongue often fails to act.

(b) *Saline Infusions*.—These act as a diuretic, and are very valuable, as they dilute the toxin. Jardine's formula is the best, viz. one drachm each of sodium chloride and sodium acetate to the pint of sterile water at 104° F. With a trocar run in from one to two pints into the cellular tissue under the mamma or axilla. Repeat in one or two hours if required, using the other mamma or axilla. Saline may also be given intravenously, especially if venesection is performed.

(c) *Diaphoresis*.—This is promoted by a vapour bath lasting for half an hour.

*Methods*.—1. Wrap the patient in a blanket, and pack her round with hot-water bottles rolled up in damp flannel, but be specially careful to see that the hot bottles do not touch the patient, or very severe and extensive burns will result.

2. *Wet Pack*.—Wrap the patient in a sheet wrung out of water at 100° F., and cover with mackintosh and blanket. Then pack hot-water bottles round the patient.

3. *Steam Bath*.—Place a cage over the patient, and pass in steam from a kettle.

Pilocarpin is dangerous, as it is very depressing, and favours oedema of the lungs. As oedema of the lungs is one of the causes of death, this drug should never be used.

(d) *Diuretics*.—Saline infusions as above.



Fluids should never be given by the mouth to a comatose patient, owing to the danger of their getting into the lung, but as soon as the patient is able to swallow, diuretics and milk should be administered.

(e) *Venesection*.—Withdraw from 10 to 15 ounces from a vein in the arm. It is indicated when oedema of the lungs threaten, or the right heart become engorged, and it may be done with advantage in other cases not showing great tension of the pulse.

If venesection is performed, it should always be followed by the infusion into the same vein of one or two pints saline.

(f) *Decapsulation of the Kidneys*.—Edebohl's operation seems to do good in some cases, the special indications being anuria or marked oliguria.

**After-treatment**.—The patient should be kept absolutely quiet and on low diet till the albumen disappears. She should drink fluids copiously to keep the kidneys acting freely, and the bowels should be daily opened by saline laxatives.

**Nursing of Child**.—The milk contains the toxin in such quantity that it will prove fatal to the child, so the mother must on no account nurse unless she makes a speedy recovery from the toxaemia. If the mother has completely recovered, and she is able to nurse, the mammae should be thoroughly emptied of all the milk they contain, and allowed to fill again before the child is put to the breast.

**Prognosis for Future Pregnancy**.—If the patient completely recovers, and there is no evidence of chronic nephritis, then future pregnancies will probably be free, as repeated eclampsia is rare, occurring only in about one per cent. of cases.

If chronic nephritis arise and persist, then the patient should not become pregnant again, owing to the risk of aggravating the disease and causing uraemia. (See "Nephritis and Pregnancy.")

#### 14. Death of the Mother during Labour.

**Causes**.—Death may occur during labour from (1) exhaustion; (2) acute anaemia from accidental or unavoidable haemorrhage; (3) rupture of the uterus; (4) eclampsia; (5) sepsis; (6) cardiac or lung disease; (7) air embolism.

### Air Embolism.

Air may enter the uterine veins during labour or in the puerperium.

**Cause.**—(a) Placenta praevia; (b) rupture of the uterus; (c) careless vaginal or uterine douching, especially if the douche tube is full of air when introduced into the uterus; (d) if operative procedures, such as version or separation of the placenta, are conducted with the patient lying on her side, air easily enters the uterus, and may get into the open uterine veins.

**Symptoms.**—There is sudden onset of great dyspnoea, which ends in sudden death.

Post-mortem examination shows the presence of air in the uterine veins, inferior vena cava, heart and coronary arteries.

**Prophylaxis.**—In performing such operations as version or separation of the placenta, and especially with placenta praevia and rupture of the uterus, carry out all manipulations with the patient on her back, with the shoulders slightly raised, and not lying on her side.

When giving a douche, see that all air is expelled from the tube, and that the lotion is running out of the catheter before it is introduced into the vagina or uterus.

## V. Complex Labour on Part of Child.

### 1. Prolapsus Funis.

1. Cord may *present*. It lies in front of the presenting part, the membranes being intact.

2. Cord may *prolapse*. The membranes are ruptured, and the cord lies in the cervix or vagina in front of the presenting part.

3. Cord may *be expressed*. It is forced out between the presenting part and the cervix, whether it has presented or not in first stage. This is apt to occur in deformed pelvis, even after reposition.

**Cause.**—It is commoner in multiparae. If it occurs in a primipara, and the head presents, then there is almost certainly a deformed pelvis.

(a) *Imperfect adaptation of the passages to the presenting part from*—(1) Deformed pelvis (30 per cent.); (2) malpresentations,



especially footling and shoulder; (3) hydramnios and sudden escape of liquor amnii; (4) pendulous abdomen; (5) small head; (6) premature or dead foetus.

(b) *Low implantation of the placenta* in the uterus or of the cord on the placenta.

(c) *Long cord*.

**Diagnosis.**—*Funic Presentation*.—Feel through the unruptured membranes a cord-like structure which pulsates and rolls under the finger.

*Funic Prolapse*.—The cord is easily felt when it lies in the cervix or vagina, as the finger can be hooked round it. If not pulsating, the child may yet be alive, so auscultate the foetal heart for signs of life.

**Differential Diagnosis.**—Bowel protruding from a rupture of the uterus has the mesentery attached to it.

**Prognosis.**—*Mother*.—This depends on the cause (*e.g.* deformed pelvis), and the amount of interference required.

*Child*.—Grave, from asphyxia, as the cord is compressed between the presenting part and the cervix. Head and face cases are worst, as the pressure on the cord is great. In transverse cases it is not of such importance, as version must be performed in any case.

**Management.**—The rule should always be observed of making a vaginal examination as soon as the membranes rupture, in case the cord should happen to prolapse, for the sooner it is recognized and treated the better is the prognosis for the child.

*Slowing or absence of pulsations* in the cord when palpated during a uterine contraction shows that it is being seriously compressed.

A *graver sign* is *slow pulsation* during the interval between the pains, as this indicates asphyxia and the urgent necessity for speedy delivery.

*Entire absence of pulsation* does not necessarily always mean that the child is certainly dead, so before deciding as to death as an indication whether to interfere or not, carefully auscultate over the uterus for the foetal heart.

Convulsive movements of the limbs in a partly born breech case, or after version, show that the child is still alive, although the cord is pulseless, so speedy delivery may save its life. If the child is certainly dead, leave the case to nature, and do not

interfere unless called to do so by some other complication, such as a transverse presentation or deformed pelvis.

If the child is alive, interference is absolutely necessary if the child's life is to be saved, as complete and continuous compression of the cord for five minutes is fatal.

(A) I. *Cephalic Lie; Membranes Intact; Cord presents.*—(1) *Posture.*—(a) Lying on opposite side from cord; (b) genu-pectoral position. Keep membranes intact as long as possible. (2) If these fail, and the foetal heart slows, perform *bipolar version*.

II. *Membranes Ruptured; Os Narrow; Cord Prolapsed.*—(a) Genupectoral or Sims' semiprone position. Try to return and retain the cord above the head (i) with *fingers*, pushing up between the pains; then try and make the head engage by pressure on the fundus uteri. If this fail, or if the os is too narrow, try (ii) *instrumental reposition* by a gum elastic catheter (Fig. 106), which may be left in position till the child is born. (b) If these fail, insert *de Ribes' bag*, which dilates the cervix and keeps up the cord; or (c) you may *dilate* the cervix and *do version*, or apply forceps if the os is fully dilated.

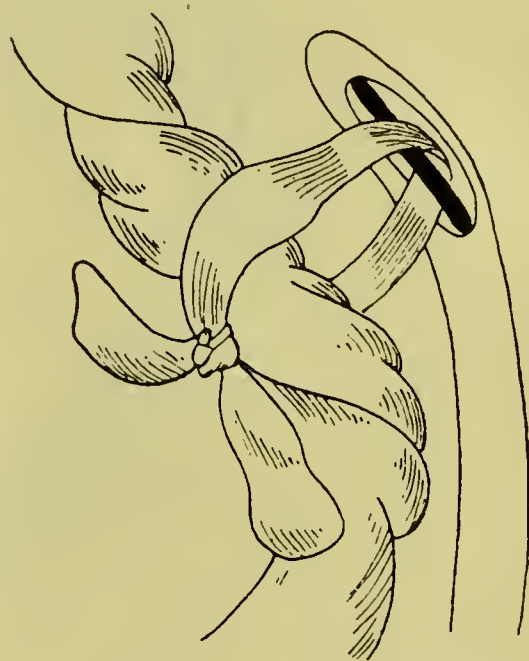


FIG. 106.—METHOD OF REPLACING A PROLAPSED CORD BY MEANS OF A GUM ELASTIC CATHETER.

III. *Membranes Ruptured; Os Dilated.*—Reposition as under II. Failing this, version; in justo-minor pelvis use forceps.

IV. *Head in Pelvis, Second Stage.*—The cord is pulsating or the heart is beating if the cord is not, showing the child is still alive. Apply forceps and deliver quickly.

(B) *Breech Lie.*—(1) Bring down the anterior leg, and extract if the cord become compressed. (2) Breech in pelvis (second stage) and cord compressed. Extract by breech.

(C) *Transverse Lie.*—Podalic version must be done in any case.



## 2. Plural Births.

**Frequency.**—Twins, 1 in 88 ; triplets, 1 in 8000 ; quadruplets, 1 in 385,000 labours.

**Predisposing Causes.**—Twins are commoner in primiparae, especially if elderly, and the tendency increases with successive pregnancies. Plural pregnancy may occur more than

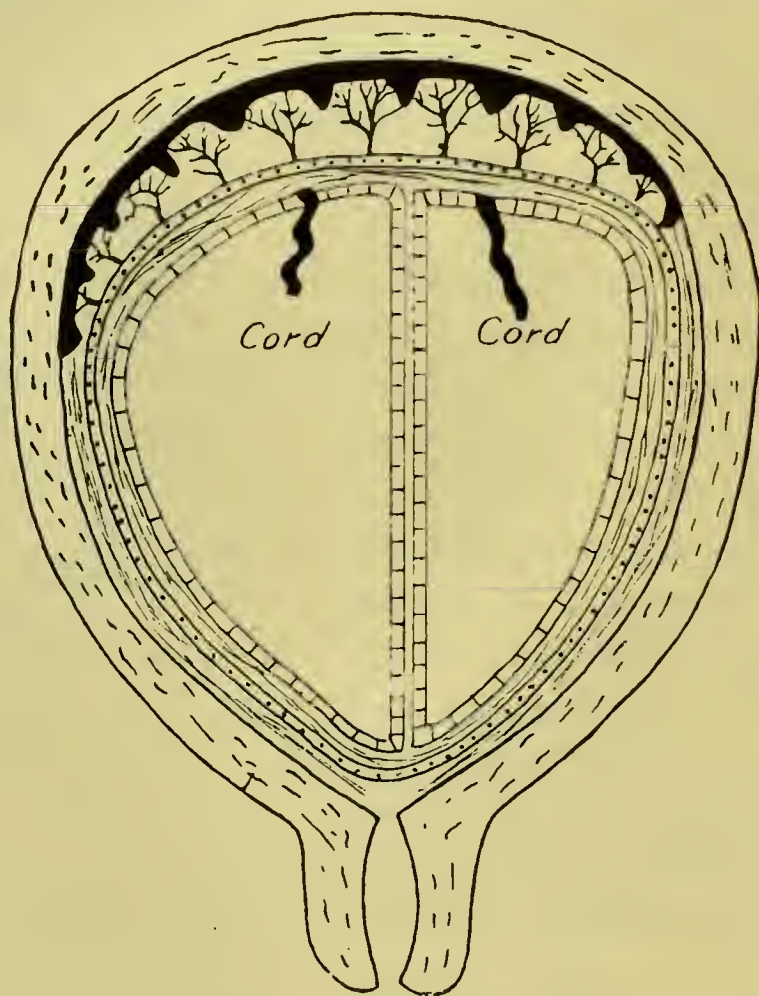


FIG. 107.—UNIOVULAR TWINS. ONE CHORION. PLACENTAE JOINED.

once in the same mother. It is commoner in some countries (Ireland, 1 in 58, Russia), and among relatives of those twinning. Heredity is seen, especially through the mother's side, but there is a paternal influence in some cases.

Twins may be *binovular*, *i.e.* from separate ova—physiological. *Uniovular*, *i.e.* from a single ovum—pathological.

**Causes.**—1. Two ovisacs may burst in one or both ovaries, and both ova are fertilized; thus two corpora lutea are formed.

2. One ovisac containing two ova ruptures, and both ova are fertilized. Only one corpus luteum is found.

3. Twins may arise from one ovum by (*a*) a double germinal

area; (b) a split of one germinal area, complete, or incomplete, forming monsters, or teratomata.

4. Superfecundation or superimpregnation: ova are fertilized at different inseminations during the same intermenstrual period.

5. Superfoetation. This implies fertilization of an ovum when the uterus is already gravid, and is most improbable, as it

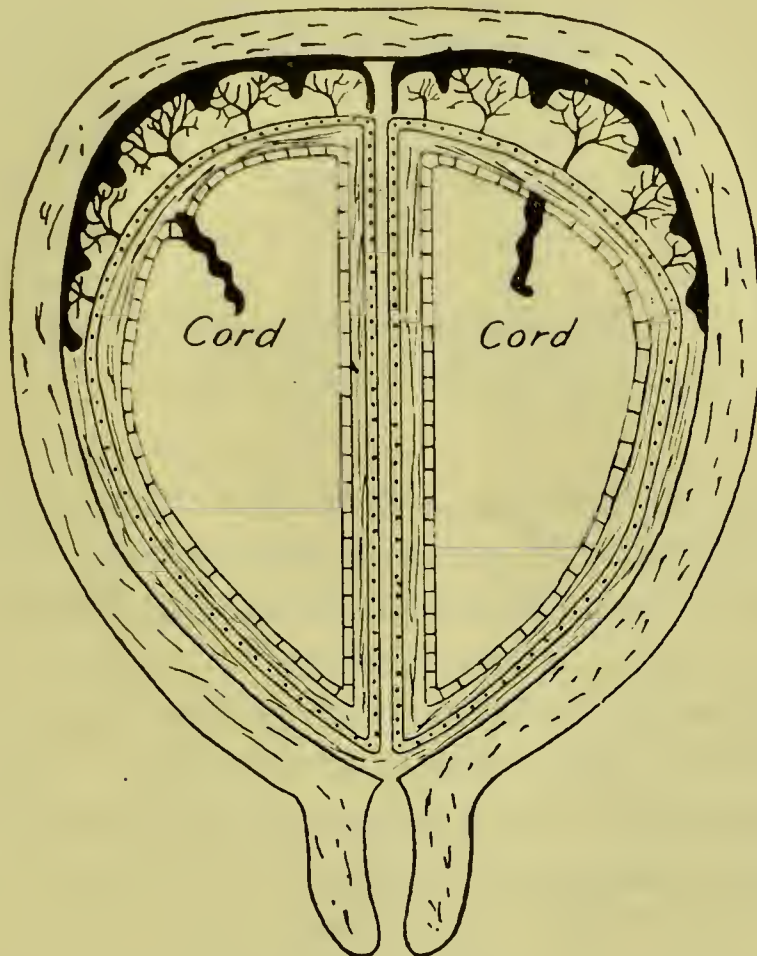


FIG. 108.—BINOVULAR TWINS. TWO CHORIONS. PLACENTAE SEPARATE.

has not been shown that ovulation continues during pregnancy. It is more likely to be due to one foetus being better developed than the other, so that one is larger than the other when the twins are born, and they are only apparently of different ages.

6. A double uterus may produce twins, one foetus being developed in each half.

#### Anatomy.

#### *Uniovular Twins*

(Fig. 107).

#### *Binovular Twins*

(Fig. 108).

Decidua vera,	- Common to both foetuses.	Common to both unless the uterus is double.
Decidua capsularis,	Common to both foetuses.	Each foetus has its own.
Chorion,	- Common to both foetuses.	Each foetus has its own.
Amnion,	- Each foetus has its own.	Each foetus has its own.



	<i>Uniovular Twins</i> (Fig. 107).	<i>Binovular Twins</i> (Fig. 108).
Amniotic cavities,	The two cavities are separated by two membranes, viz. the amnion of each. A common sac is due to rupture.	The two cavities are separated by four membranes, viz. the amnion and chorion of each. A common sac is due to rupture.
Placenta,	The placentae of each foetus blend so that an injection into one cord will fill the blood vessels of both placentae.	The placentae are quite separate even although they are fused. An injection into one cord will only fill the blood vessels of the placenta to which it belongs.
Cord,	Each foetus has its own, although the cords may fuse.	Each foetus has its own.

*Frequency, Sex and Size.*—Binovular twins are six times commoner, and about 33 per cent. show different sexes, *i.e.* one male and one female. Uniovular twins are always of the same sex, either two males or two females.

Twins are usually smaller and lighter than single children, the average of both together being about 10 lbs. One is usually larger and frequently much better developed than the other.

**Course during Pregnancy.**—*Mother.*—1. She may have oedema of the vulva and lower limbs towards the end of pregnancy, due to the great over-distension of the uterus interfering with the circulation.

2. Varicose veins of the lower limbs may be exceedingly troublesome from the same cause.

3. Premature labour is frequent.

*Child.*—1. One foetus may die and be retained, while the other develops to full time.

2. The dead foetus may be expelled from the uterus, while the other is retained and develops to full time.

3. The dead foetus may form a foetus papyraceus or compressus, but usually in the first half of pregnancy. The liquor amnii is absorbed, the dead foetus mummifies and becomes flattened by the pressure of the other growing foetus. It is found as a flattened object in the membranes when the other twin is born.

4. One foetus may develop at the expense of the other (with uniovular twins only), the circulation from the healthy foetus causing a reversal of the blood stream, and a backward pressure on the other's heart, which is destroyed, leading to the development of an acardiac (Fig. 109) monster. (See further under "Monsters.")

5. One foetus may develop as a hydatidiform mole.

6. One foetus may have hydramnios.

7. If both lie in a common sac formed owing to rupture of the intervening membranes, the umbilical cords may become so twisted as to cause the death of one or both foetuses during pregnancy, or it may be not till during labour.

**Diagnosis of Twins.**—This may be easy, but in other cases it is very difficult, and the presence of a second twin is not discovered till after the birth of the first.

The following points may be noted:

1. Unusual size of the uterus. An enlargement may, however, be due to an excess of liquor amnii, and on the other hand the uterus may not be much enlarged if the twins are small.

2. In some cases a groove is felt in the uterus.

3. It may be possible by external and vaginal examination to note:

(a) One foetal head in the fundus and another at the pelvis.

(b) Two heads close together, or a breech and a head in the fundus or pelvis.

(c) An unusual number of small parts.

(d) By auscultation two hearts of different rates may be heard, or their points of maximum intensity are at different places over the uterus.

(e) During the first stage of labour, vaginal examination may show two bags of membranes or two foetal parts presenting.



FIG. 109.—ACARDIAC-ACEPHALOUS FOETUS.

**Diagnosis after Birth of First Twin.**—The fundus of the uterus, instead of sinking to about the level of the umbilicus, as it should after a child is born, remains high up, and



palpation shows the presence of a second foetus. Vaginal examination shows another bag of membranes and presenting foetal part.

**Presentations.**—(a) Both head, 47 per cent.; (b) head and breech, 34 per cent.; (c) head and transverse, 6 per cent.; (d) breech and transverse,  $3\frac{1}{2}$  per cent.; (e) both transverse,  $\frac{1}{2}$  per cent.

These percentages are only approximate, as they vary in different hospital statistics.

**Prognosis.**—*Mother.*—There is increased risk from :

- (1) primary inertia, due to over-distension ;
- (2) increased tendency to eclampsia ;
- (3) malpresentations and locking of twins, requiring interference ;
- (4) increased risk of post-partum haemorrhage, due to inertia from over-distension, and risk of this haemorrhage being more severe owing to the large double placental site ;
- (5) greater danger should sepsis arise, owing to the large placental site.

*Child.*—There is increased mortality from prematurity, poor development, or weakness.

**Mechanism.**—The first child is born as in normal labour, but the labour is apt to be delayed owing to primary inertia, due to over-distension of the uterus.

After the first child is born, the uterine contractions return in 15 or 30 minutes if there is no inertia, and the second child, if not larger, is born within an hour.

If there is inertia of the uterus, the pains may not return for hours, or even days, after the birth of the first child, if the case is left to nature.

Usually the placentae do not come away till the second child is born, but in rare cases each placenta follows each child after it is born, or both may even be born before the birth of the second child.

If the placentae are fused, they come away together in the third stage, otherwise the one follows the other.

**Management of Labour.**—Manage the first child as in normal labour, but guard against the risks due to primary inertia, and limit internal examinations as much as possible, owing to the greater seriousness of introducing sepsis in the presence of a large placental site.

Carefully tie the placental end of the cord, as in the case of uniovular twins the second foetus can bleed through the cord of the first.

As soon as the first child is born and the cord tied, examine to determine the presentation of the second, as, if it prove a transverse, version must be performed without delay.

Carefully watch the heart of the second child, as there may be a premature separation of its placenta (usually shown by increased haemorrhage), which will cause asphyxia, demanding immediate interference and rapid delivery for the sake of the child.

If all goes well, wait for half an hour to see if the pains return, and if inertia continue, stimulate the uterus to contract by friction. If this fail, and an hour has passed, do not wait longer, but rupture the membranes and deliver the child by expression on the fundus, application of forceps, or by version. The passages being already dilated, delivery can be speedily done if required, otherwise deliver slowly so as not to empty the uterus too rapidly.

In the third stage, keep the hand on the uterus, and, if it is atonic, stimulate contractions by friction, and if required, inject a full dose of ergot or ernutin.

After the placenta is born, inject ergot, if not already given, and guard against post-partum haemorrhage.

Indications for speedy delivery of the second child are :

- (1) prolapse of the cord ;
- (2) haemorrhage from premature detachment of the placenta ;
- (3) threatened asphyxia.

**Complications and Management.**—1. *Both Membranes present.*—

(a) Rupture the lower if both heads present ; (b) if head and breech present, rupture the head case.

2. *Both Foetuses present together.*—(a) Push back the upper one and allow the lower to engage ; (b) if head and breech present, push back the breech to let the head come down.

3. *Locking, both Head Cases.*—The head of the second may jam between the chin and thorax of the first child, whose head is lower. (a) Extract the head of the first with forceps, then the second head ; (b) the first child is more likely to die, so save the second, and, if forceps fail, perforate the head of the first, and, if required, decapitate, then deliver the second.



4. *Locking, Breech and Head Case* (Fig. 110).—The breech of

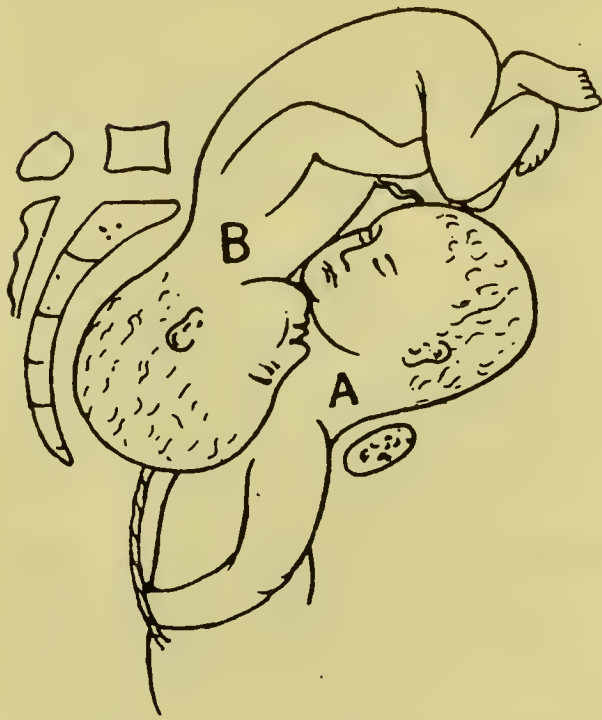


FIG. 110.—LOCKING OF TWINS DURING DELIVERY IN A BREECH AND HEAD PRESENTATION.

the first is born, but the head of the second lies between the chin and thorax of the first, and the chins are locked. A usually dies, so save B. (a) If both are alive, try to push up and unlock the chins; (b) if this fail, extract the head of B with forceps, and, if the whole child does not follow, then deliver the head of A by hand or forceps; (c) if this fail, or if A is dead, then decapitate A and save B by forceps, then deliver the decapitated head.

5. *Locking, both Breech Cases*.—The head of the first

lies against the thorax of the second. Push back the second child, and free the head of the first.

### 3. Monsters.

(a) *Single Monsters*.

*Acardiac Monster*.—A foetus without a heart (Fig. 109). This monster can only occur with uniovular twins, the other twin being well-developed. The blood pressure of the normal twin overcomes and reverses the blood stream of the other, leading to a destruction of its heart—acardiac. The same cause may produce still further deformities, such as absence of head—*acephalous* (Fig. 109), or upper part of trunk—*acormous*. If the deformity extends so far as to make the human form unrecognizable, it is called *amorphous*.

**Management at Labour**.—These monsters are usually born second of the twins, and difficulty is only likely to arise if the trunk is swollen by oedema, in which case perforate if traction by the feet fail.

*Anencephalous or Hemiccephalous Monster* (Fig. 111).—The brain and the cranium are absent, the base of the skull being exposed.

**Diagnosis**.—If the top of the head present, the nature of the presentation is at first puzzling until the finger recognizes the

bony projections in the base of the skull. These monsters frequently present by the face, and are born as such. Hydramnios frequently occurs.

*Labour* is usually easy, but delay may occur from the relatively large shoulders.

**Management.**—If delay occur due to the shoulders, apply a blunt hook under the axilla, and extract, or perform cleidotomy, *i.e.* cut the clavicles.

(b) *Double Monsters.*

There are many varieties of double monsters, from simple union at one part, to cases where nearly the whole bodies are united.

1. Incomplete double formation. The monsters are more or less fused.

(a) Diprosopus = two faces.

(b) Dipygus = two breeches.

(c) Cephalo-thoracopagus = double face and trunk.

2. The foetuses are joined by the trunk.

(a) Thoracopagus-dicephalus. Thorax joined, double headed.

(b) Xiphopagus, sternum joined.

3. The foetuses are joined at some part of head or trunk, but are otherwise well developed.

(a) Craniopagus, head joined.

(b) Ischiopagus, hip joined.

(c) Pygopagus, breech joined.

**Diagnosis.**—Double monsters are only likely to be recognized by passing the whole hand into the uterus to ascertain the cause of delayed labour.

**Prognosis.**—Premature labour is frequent, so that they may be born spontaneously. In other cases, labour can be so obstructed that embryotomy is necessary.

**Treatment.**—If labour is delayed, delivery must be effected by forceps, version, or embryotomy, according to nature of obstruction.



FIG. 111.—ANENCEPHALOUS FOETUS.



## VI. Affections of New-Born Infant.

### 1. Apnoea, or Asphyxia Neonatorum—Still Birth.

The child is still-born, but not dead, as the heart still beats, however feebly. There may be a few spasmodic attempts to respire in the less severe cases.

**Causes.**—I. *Prolonged or severe compression of the head* from (a) tedious labour, (b) deformed pelvis, (c) face case, (d) difficult forceps, (e) intracranial haemorrhage.

II. *Interference with the foetal circulation* from (a) compression of the cord from prolapsus funis, from its being tightly coiled round foetus, or being caught by the after-coming head; (b) compression and anaemia of the placenta from tonic contraction of the uterus, or giving ergot during labour; (c) premature separation of the placenta in placenta praevia, and accidental haemorrhage; (d) tearing of the vessels in a velamentous insertion of cord, so that the foetus bleeds from the cord.

III. *Interference with the foetal respiration* from (a) premature attempts at respiration (usually in breech cases), sucking mucus and fluids into the trachea; (b) goitre pressing on the trachea; (c) abdominal tumours or ascites, preventing the diaphragm acting.

IV. *Interference with the maternal circulation* from (a) eclampsia, the foetus is poisoned by the toxin; (b) cardiac and lung disease; (c) death of the mother.

**Two Forms.**—I. *Asphyxia Livida*.—The surface is cyanosed. Muscular tonicity is present. The cardiac beats are slow but forcible, and there are occasional spasmodic attempts at respiration.

II. *Asphyxia Pallida*.—The surface is pale and corpse-like and the child lies limp and flaccid, with an expressionless face. There is no muscular tonicity, and reflex excitability to skin stimulus is abolished. The cardiac beats are frequent and feeble, and in very bad cases, slow and feeble.

**Prognosis.**—However feeble and slow the heart may beat, there is always a chance of saving the child by artificial respiration, so that the efforts at resuscitation should be continued

as long as the heart beats are audible to the ear placed against the child's cardiac region, and until it breathes properly, acquires a rosy tint, opens its eyes, and moves its limbs. Failure at resuscitation means that the child has been too long asphyxiated to recover, or that there is a complicating cerebral compression, as from intracranial haemorrhage.

**Treatment.**—Asphyxia pallida represents a severer form than asphyxia livida, and as the one passes into the other there are cases on the borderline, where it is difficult to say if the child has entirely lost any responsiveness to stimulation of the skin. In such doubtful cases, if the child does not promptly respond to stimulation, artificial respiration should be begun without wasting further valuable time.

I. *Asphyxia Livida*.—The child is not necessarily livid, and the surface may be pale, but as muscular tonicity and reflex excitability are retained, stimulation of the skin acts well, and in the slighter cases may be sufficient to start respiration.

1. Clean out mucus from the mouth with a soft cloth, and suck out any fluids with a catheter, passed as far as the glottis.

2. Next hold the foetus up by the feet and slap the gluteal region and dash cold water over the chest.

3. If this fail, dip the child alternately in a hot (98° F.) and cold (50°-60° F.) bath. While the child is lying in the hot bath artificial respiration can be done.

4. If these fail, at once commence artificial respiration, and continue till the child can breathe of itself, and the skin acquires a rosy hue.

II. *Asphyxia Pallida*.—There is no use wasting valuable time trying reflex stimulation, so clean the mouth and throat as above, and at once commence artificial respiration, the cord being tied and cut meanwhile.

*Methods of Artificial Respiration.*—1. *Author's Method.*—As it is very important to maintain the body heat, the author keeps the child lying in a hot bath at 100° F., which is kept at this temperature by the addition of hot water as required. A modified Sylvester is done, and the child is not removed from the bath till it recovers. The child is held by the same grip as is described for Schultze's method, and lies on its back just under water. For *inspiration* the back is lifted and extended by the finger tips, while the thumbs pull back the shoulders and upper arms, thus arching the thorax. For



*expiration* the child is allowed to sink to flex the back, while the forefingers push the shoulders and upper arms forwards and inwards, the thumbs being used to gently compress the front of the chest. The head is supported by the ulnar aspects of the wrists. Continue the movements at the rate of about 10 or 12 per minute.

2. *Schultze's Method* (Figs. 112, 113).—*First Act* (Fig. 112).—Hold the child, face to front, with the thumbs over the clavicles on the anterior chest wall, the forefingers hooked

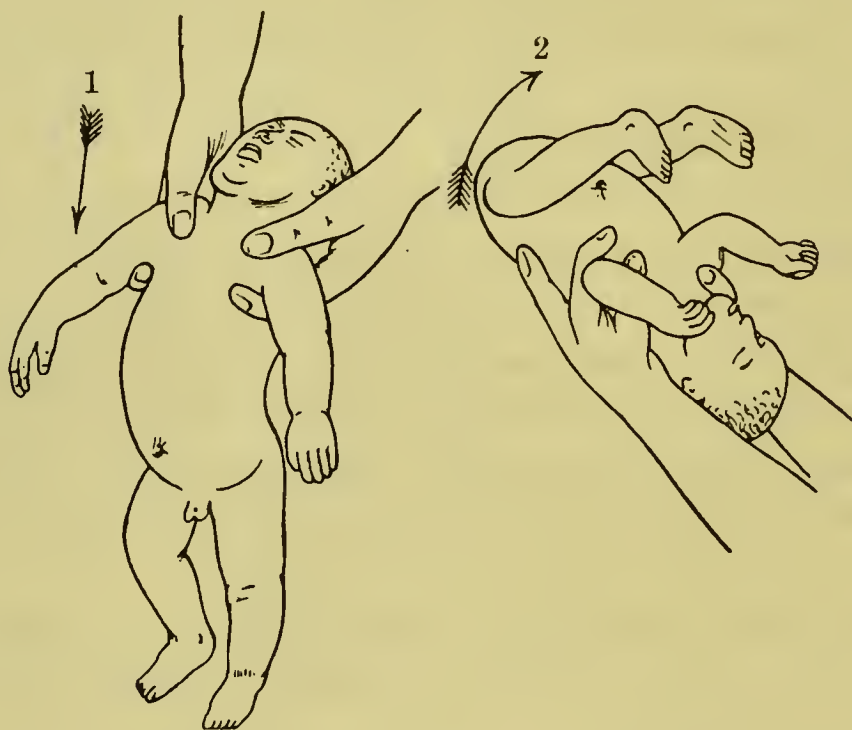


FIG. 112.

FIG. 113.

ARTIFICIAL RESPIRATION BY SCHULTZE'S METHOD.

1. Inspiration by downward swing.
2. Expiration by upward swing.

into the axillae from behind, and the remaining fingers spread over the back of the thorax. The back of the head is firmly held between the hypothenar eminences of the palms and ulnar surfaces of the wrist.

*Second Act.—Expiration* (Fig. 113).—Standing with legs apart, slowly swing the child upwards in front of your face, until the legs begin to come over, when you let the lower part of the trunk and the lower limbs flex on the upper part of the trunk. Thus the thorax is compressed and the diaphragm is pushed upwards by the abdominal viscera.

*Third Act.—Inspiration* (Fig. 112).—After a short pause, swing the child downwards till it reaches its original position. The thorax is thus extended and the abdominal viscera

gravitate downwards, allowing the diaphragm to descend. The movements are continued at the rate of 8 or 10 per minute.

Swinging the child rapidly chills the surface, so it must be placed frequently in a hot bath till it is warmed again.

The method is not free from danger, as injuries may be caused, especially by careless manipulation, and the author has seen a child sent flying across the room by an operator who held the child too loosely, and let it slip from his grasp, while performing the second act of expiration.

The method is contra-indicated for feeble or premature children.

3. *Buist's Method*.—Place the child flexed and face down on the palm of the right hand, which supports the upper part of the trunk. The head is away from the operator, and with the limbs is allowed to hang down.

*Inspiration*.—The child is quickly rolled over and almost thrown to the left hand, on which it lies extended on its back, the head and limbs hanging down.

It is then rolled back to the right hand, and so on from hand to hand, pressure of the fingers aiding expiration.

4. *Byrd's Method*.—Hold the child on its back, grasping the extremities of the trunk with both hands. The trunk is alternately flexed and extended.

5. *Inflation of the Lungs by Intubation of the Larynx*.—A catheter is passed through the glottis under guidance of the forefinger passed to the pharynx. The lungs are inflated by blowing in mouthfuls of fresh air, the act of expiration being performed by compressing the thorax.

The catheter is often difficult to pass, and there is danger of causing emphysema or even rupture of alveoli, if more than a mouthful of air is blown in.

6. *Mouth-to-Mouth Insufflation*.—Apply the mouth to the child's mouth, and blow in mouthfuls of fresh air. The nostrils are held to prevent the air escaping by the nose, and air is prevented going down the gullet by pressing the trachea backwards against the spine, or by compressing the abdomen. Air is expelled by pressure on the chest.

A hot rectal saline up to 2 ounces may be given in bad cases, and strychnine gr.  $\frac{1}{300}$  in  $\mathfrak{M}$  v of brandy or whisky injected hypodermically.



## 2. Cephalhaematoma.

This is a fluid swelling due to an effusion of blood between the bone and pericranium, owing to a detachment of the periosteum and consequent rupture of blood vessels from injury during labour.

It appears a few hours after birth, but in some cases not for one or two days.

It occurs most commonly over the right parietal bone, next over the left parietal, and, in some cases, may occur simultaneously over both parietals.

The swelling is always *limited by* and never crosses *the sutures*.

At first small, it gradually increases in size. It may remain as small as a walnut, or it increases to the size of a large egg, or it may gradually enlarge for several days until it forms a large swelling completely covering the whole parietal bone up to the sutures and pushing the ear forward.

It is less common on the occipital bone.

The swelling is at first uniformly tense, but later has firm edges, and the blood gradually absorbs.

Intracranial haemorrhage between the dura mater and bone may coexist, causing compression, shown by convulsions, drowsiness, stupor and vomiting.

**Diagnosis.**—It appears after delivery, forms a soft fluctuating swelling, which increases in size, and is strictly limited by the sutures. It causes no disturbance in the child.

**Differential Diagnosis.**—1. *Caput Succedaneum*.—The child is born with this swelling. It is *in* the scalp, forms on the presenting part, and is found over sutures and fontanelles. It does not increase in size after birth, and disappears in a few days.

2. *Meningocele*.—This occurs through an opening in the cranium, and has an impulse when the child cries.

3. *Abscess*.—There are the usual signs of inflammation, such as heat, pain and tenderness.

**Prognosis.**—They rarely disappear in less than about six weeks, and a thickening may be felt for many months.

**Treatment.**—Leave them alone, and advise the mother to protect the swelling from injury. Should they inflame and suppurate they must be opened and drained. If symptoms

of cerebral irritation develop, incise, clear out the clot, look for a fracture, and treat as below (see "Fracture of Skull").

### 3. Indentations of Skull.

These are usually caused by pressure in deformed pelvis, especially flat pelvis, from the sacral promontory, and form furrow- spoon- or cup-shaped depressions. Slight cases may disappear, but severe cases may cause nervous symptoms, prove fatal, or lead to poor health.

**Treatment.**—Some may be corrected by manual compression of the head. If this fail, operate and raise the depression. Tweedy lifts the depression subcutaneously by using the point of one blade of a bullet forceps.

### 4. Fractures of Skull.

This most frequently occurs in the parietal bone.

**Cause.**—Undue compression in a deformed pelvis, or injury from forceps.

**Symptoms.**—There may be both external haemorrhage (cephalhaematoma) and intracranial haemorrhage, the latter causing symptoms of cerebral irritation or compression, which may prove fatal.

**Treatment.**—If pressure symptoms are present, incise and elevate, or trephine.

### 5. Omphalorrhagia.

This is haemorrhage from the navel, and may occur from the ulcerated surface before the cord drops off, or just afterwards.

**Cause.**—Syphilis or sepsis.

**Prognosis.**—It is fatal in most cases.

**Treatment.**—Endeavour to check it by styptics and pressure. If this fail, pass a hare-lip pin through the wound, and close with a figure-of-eight ligature.



## PART VII.

### PATHOLOGY OF PUERPERIUM.

#### I. Affections of the Mammae.

##### 1. Functional Disturbances.

**Agalactia.**—Absence of or too little milk.

(a) *Absolute*.—This is rare, and treatment is useless.

(b) *Relative*.—There is not enough milk to satisfy the child, the flow being scanty.

**Treatment.**—Stimulation by suckling is the best remedy, so the child should be put to the breasts to empty them at regular intervals, and the efforts should be persisted in for some weeks at least.

At the same time give the patient copious liquid, nourishing food, especially milk, eggs, malt, rich soups, and preparations such as somatose (see also “Scanty Milk” p. 170).

**Galactorrhoea or Polygalactia.**—Excess of milk. A thin milky secretion continues to escape from the breast after the infant has finished its meal. The clothing gets soaked, and the skin, being constantly wet, becomes sodden and excoriated.

If the discharge is very profuse, it proves so exhausting to the mother that she gets anaemic, weak and emaciated. The child may also suffer from starvation if the milk is too watery.

**Treatment.**—Try regulation of the diet, limiting especially the fluids. Keep the bowels open by saline laxatives, and administer potass. iodid. internally.

If these fail, and mother or child are affected, stop nursing (see also “Milk too Abundant” p. 170).

**Imperfect Development of Nipples.**—The nipples may be so small that it is impossible for the child to suck. In such cases

try the effect of a rubber nipple shield, but, if it fail, artificial feeding must be resorted to. For umbilicated nipples nothing can be done.

## 2. Fissures and Excoriations of the Nipples.

**Cause.**—The act of sucking loosens and removes the epidermis, forming excoriations on the surface. Fissures arise from denudation of the clefts in the nipple.

The condition is more apt to arise if the nipples are not carefully washed after suckling to keep them clean and free of crusts.

**Symptoms.**—The patient complains of pain, which may be almost unbearable, when the child sucks. Examination readily detects the denuded areas.

**Prognosis.**—The process of constant suckling prevents them healing, and if they are infected by cocci, mastitis and mammary abscess are readily caused. They sometimes bleed, so that the child sucks in blood during suckling, causing black stools—*meloena spuria*.

**Prophylaxis.**—During pregnancy the nipples may be hardened by alcohol, but this should not be overdone, as if the epidermis is too hard it fissures more readily. After each suckling the nipples should be carefully washed by a saturated solution of boric acid, then dried and smeared with an ointment containing one drachm each of bismuth subnitrate and borax in vaseline two drachms, and *adeps lanae hydrosi* half an ounce.

**Treatment.**—First try the above ointment and boric lotion, which are often successful. Smearing with tinct. benzoin comp. or Peru balsam, and covering with sterile gauze, also acts well. Some recommend equal parts of glycerine of tannic acid, and sulphurous acid. If nitrate of silver is used, suckling must be stopped to give the wounds time to heal, otherwise this remedy only aggravates the condition.

Healing may be aided if the child sucks through a rubber teat.

If the denuded areas will not heal, stop lactation for a few days, and treat as above. The milk is drawn off regularly, so that the breasts will not dry up. Should mastitis threaten, remove the child at once. The symptoms may then pass off, when the child can be put to the breast again.



### 3. Mastitis and Mammary Abscess.

**Cause.**—Mastitis is always due to bacterial infection, the germs being introduced from without. Milk engorgement may be a predisposing cause, but will not of itself cause inflammation without the invasion of bacteria into the glands, where they find a good culture medium in the retained milk.

The usual cause is the passage of staphylococci, less often streptococci, along the lymphatics from infected fissures and excoriations. This leads to inflammatory exudation into the interstitial tissue (phlegmonous form), the glands being secondarily involved.

Less often the germs pass along the milk ducts and infect the glands (parenchymatous form). Resolution may take place or it may go on to abscess formation.

Dirty fingers, want of cleanliness, or dirty clothing in contact with the nipples, may be the means of infecting them. It is more frequent in primiparae, and usually only one breast is affected.

**Symptoms and Signs.**—These usually begin from the second to the sixth week with shivering, rigor, fever, and pain in the breast.

A very tender hard lump, or more rarely a diffuse infiltration, is easily palpable.

**Abscess.**—If resolution does not occur, shown by a fall of fever, and diminution in pain, then in a few days suppuration begins. The pain increases, the temperature remains high, the axillary glands swell, and any movement of the arm is painful. As the pus nears the surface the skin gets red and feels hot.

**Prognosis.**—This depends on treatment. If promptly treated, a mastitis may resolve, and, if when pus forms, it is at once evacuated, cure is speedy and complete. If, however, it is left alone, the pus accumulates, and before the abscess bursts the whole breast will reach a large size, and be almost completely riddled with large pus cavities. If it is still untreated, sinuses will form and continue to discharge for months till the whole breast is destroyed.

**Prophylaxis.**—Prevent fissures forming in the nipples, and when they do form promptly treat them as mentioned above. Warn the patient against touching the nipples with soiled fingers or clothes.

**Treatment of Mastitis.**—Nursing must be stopped at once from both breasts. Empty the breasts of milk, apply belladonna and glycerine, and firmly bandage them. Give saline purges.

*Bier's Suction Treatment.*—Cleanse the mamma, and apply Bier's sterilized glass bell. Slowly exhaust the air till the breast is drawn well in, becomes blue, and milk escapes. It must not cause pain. The hyperaemia is kept up for five minutes, then stopped for three minutes, again produced for other five minutes, and so on with three-minute intervals, the whole sitting lasting forty-five minutes. Between the sittings the affected breast is protected with a sterile dressing.

**Treatment of Abscess.**—As soon as pus forms, open freely into the pus cavity by an incision which radiates from the direction of the nipple outwards. The areola must not be cut. Thoroughly break down all loculi with the finger, swab the cavity clean with gauze, and finally pack with sterile gauze. This is left in till the third day, and thereafter the cavity is packed and dressed daily.

As the operation should be done thoroughly, general anaesthesia is necessary. It is not advisable merely to incise and insert a drainage tube. By this method sinuses form, and may take many weeks or even months to heal.

*Bier's Suction Treatment.*—With antiseptic precautions a small incision is made, the glass bell applied as described above, and the pus sucked out. If it succeeds, it has the advantage over a large incision in not resulting in such a large scar.

## II. Affections of the Uterus.

### 1. Secondary or Puerperal Haemorrhage.

Severe cases are rare, later than one or two hours after delivery. There may be a slow oozing or a sudden and copious loss of blood.

**Cause.**—1. It is usually due to a retained piece of placenta or blood clot, especially with previous inertia uteri.

2. It is liable to occur after placenta praevia.

3. It may occur from undue exertion detaching thrombi.

4. It may be due to puerperal inversion.



**Treatment.**—Remove any retained portion of placenta or blood clot, and treat as described for “Post-partum Haemorrhage,” p. 260.

**Haemorrhage occurring after the first week** is rare, and usually slight.

**Cause.**—(1) Retained portions of placenta or membranes ; (2) fibroids or fibrinous polypi ; (3) inversion ; (4) retroflexion ; (5) chorion-epithelioma.

**Treatment.**—Examine for and treat the cause. Explore the cavity of the uterus if required.

## 2. Subinvolution.

The uterus imperfectly involutes, remaining abnormally large, soft and flabby. The cavity is also larger than normal.

**Causes.**—1. Puerperal sepsis, local and general.

2. Retention of portions of placenta and membranes.

3. It may follow post-partum haemorrhage from inertia uteri.

4. It may follow premature labour.

5. It is apt to occur where there has been uterine inertia from over-distension of the uterus, prolonged labour, or rapidly recurring pregnancies.

6. Rising too soon after delivery, and performing heavy work when the abdominal muscles are flabby and the pelvic organs congested.

7. Non-lactation, and therefore an absence of the natural stimulus to uterine contractions.

8. Prolonged constipation.

9. When the uterus is small enough to fall into a position of retroflexion about the third week, this displacement favours subinvolution.

**Symptoms.**—There is an excessive lochial secretion, which may still be red in the second week, or slight haemorrhage continues for, it may be, five or six weeks.

In other cases the red discharge, which has ceased, returns when the patient rises on the tenth day, and continues, or keeps coming and going, for some weeks.

**Diagnosis.**—The uterus feels large and soft, and the fundus is higher than it should be at the time of examination if involution had progressed normally.

Continuous, somewhat profuse haemorrhage, should lead to a suspicion of retained placental tissue. Such a cause may not

produce haemorrhage till the second week. The cervix is more patulous than it should be, easily admitting the finger to palpate the uterine cavity, and detect retained placental tissue.

Haemorrhage continuing till the sixth week is not infrequently due to retroflexion, and this should be looked for.

**Prognosis.**—If untreated, it leads to various gynaecological affections causing prolonged suffering, such as chronic metritis, endometritis, etc. Fibrin may deposit on retained placental tissue, forming a placental polypus, and giving rise to the same symptoms as a polypoid fibroid.

Placental remains may become septic and lead to sapraemia, septicaemia, or even pyaemia, it may be with fatal results.

**Treatment.**—If due to retained placental tissue, this should be removed by the fingers, and under the strictest antiseptic and aseptic precautions. The author has seen death occurring from sepsis, following the removal of placental tissue in the second week of the puerperium.

A retroflexion should be replaced in the fourth week, and a pessary inserted.

All cases should be treated by rest in bed, hot vaginal douches at 112° F. twice daily, and a mixture prescribed containing ergot, iron and strychnine, to be taken thrice daily after food.

### 3. Superinvolution.

The uterus is excessively involuted.

Normally, the uterus shows hyperinvolution during the period of lactation, being smaller than before conception, but after the child is weaned, and the menses return, the uterus regains its normal parous size.

In rare instances, however, the uterus remains atrophied—superinvolution.

**Cause.**—(a) Septic puerperal endometritis.

(b) Severe post-partum haemorrhage.

(c) Protracted lactation.

**Diagnosis.**—The condition is not recognized till after the child is weaned. Menstruation does not return, and examination shows that the uterus is abnormally small.

**Treatment.**—Little can be done beyond improving the patient's general condition by good feeding and iron tonics.



#### 4. Displacements.

Inversion (see p. 263).

Retroflexion (see "Subinvolution," and text-book on Gynaecology).

Prolapse (see text-book on Gynaecology).

#### 5. Lochia.

*Suppression.*—If the lochia suddenly cease during a normal flow, the cause should be looked for. The cause may be *mechanical*, the cervix being obstructed by blood-clot, membrane, or acute flexion of the uterus. The lochia collect in the uterus, and are retained. The *symptoms* are sudden stoppage of lochia, colicky uterine pain, and sometimes a rise of temperature. The *treatment* consists in removing the obstruction and douching the uterus.

*Inflammatory.*—Suppression in this case is a symptom of puerperal infection.

*Profuse Lochia* (see "Subinvolution").

*Foetid Lochia* (see "Puerperal Infection").

### III. Haematoma of Vagina and Vulva.

This is a blood tumour formed by an effusion of blood into the connective tissue of the vagina and vulva, the mucous membrane and skin being intact. The mass is usually unilateral, and may reach a very large size, forming a tumour which half fills the pelvis and protrudes at one side of the vulva.

It usually forms during labour, and rarely appears later in the beginning of the puerperium.

**Etiology.**—It is uncommon, and is due to crushing of the soft parts and rupturing of blood vessels by the pressure of the foetal head during the second stage of labour.

**Symptoms.**—There is sudden onset of severe pain in the region of the vagina and vulva, and a bearing-down feeling in the pelvis. If much blood is effused, there is more or less anaemia and collapse.

**Diagnosis.**—If the skin is not yet discoloured, examination by the fingers detects a boggy tumour at one side of the vagina and vulva.

In the course of a few hours the blood comes near the surface, when a dark blue swelling is seen distending the vulva on one side, and extending upwards under the vaginal mucosa.

**Prognosis.**—Under favourable conditions, the blood usually absorbs in about a month. It may, however, rupture externally, and may prove fatal from haemorrhage if not controlled. It readily becomes infected and suppurates, especially if the skin is broken, and, if the haematoma is large, it may lead to a fatal septicaemia.

**Treatment.**—If it form before the head is born, and is so large as to obstruct labour, incise, turn out the clot, and after labour is over, close the wound by sutures.

During the puerperium, keep the patient at rest in bed, and protect the mass from injury.

If the haematoma continues to enlarge after labour, apply ice locally, or apply pressure by a colpeurynter (rubber bag) filled with iced water.

If the skin or mucous membrane over the mass threaten to slough from pressure, owing to its large size, make an incision, turn out the clot, and pack the cavity with gauze.

If it suppurate, open freely to allow of good drainage, and pack with sterile iodoform or bismuth gauze.

#### IV. Affections of the Bladder.

##### 1. Retention of Urine.

**Causes.**—1. The commonest cause is reflex irritation from perineal tears, suture of perineum, irritated and congested haemorrhoids, so that the patient is unable to relax the sphincter vesicae.

2. Swelling of the urethral mucosa from crushing during labour.

3. Pressure of a displaced uterus.

4. Atony of bladder or abdominal muscles.

5. In some cases it is mainly nervous or hysterical.

**Symptoms.**—The patient fails to urinate.

**Treatment.**—The disability to urinate is usually speedily recovered from.



Every means should be tried before passing the catheter, such as hot fomentations to the vulva and hypogastrium, and pouring warm lotion over the vulva while the patient lies on the bed-pan. If this fails, let the patient try while kneeling, or even sitting, so long as she is well supported.

If the catheter must be used, pass it yourself every eight hours, if the nurse cannot be trusted. The vulva must be exposed, the region of the urethra antiseptically cleansed, and a sterile glass catheter introduced under direct guidance of the eye.

The great danger is carrying in lochia and causing cystitis.

## 2. Incontinence of Urine.

The urine dribbles away.

**Cause.**—1. Paresis of sphincter vesicae. The bruising of tissues from the pressure of the foetal head may impair the nerve supply.

2. Vesico-vaginal fistula from necrosis of tissue, due to prolonged pressure.

3. Dribbling from an over-distended bladder.

4. Cystitis.

**Diagnosis.**—If due to paresis, the dribbling is not continuous, but escapes involuntarily whenever any movement or act, such as coughing or sneezing, increases intra-abdominal pressure.

If due to a fistula, the dribbling is continuous, but does not begin for some days after labour, when the slough has had time to separate.

Examination of the bladder and urine excludes over-distended bladder and cystitis.

**Prognosis.**—Paresis usually disappears spontaneously in a few days, but it may persist.

**Treatment.**—Keep the patient clean, and prevent local excoriation.

If the paresis persist, try hot douching of the bladder, massage of the urethra and sphincter or faradism, with the positive pole at the urethra. Permanent incontinence requires a colpoplasty to tighten the sphincter. Small fistulae may heal spontaneously.

Large fistulae are repaired after the tissues have returned to normal.

### 3. Cystitis.

This is usually due to a careless use of the catheter.

The symptoms, diagnosis and treatment do not differ from those given in surgical or gynaecological text-books.

## V. Constipation.—Coprostasis.

This may result from faecal accumulation before labour began, and the bowel is not thoroughly emptied by the usual purgative on the third day of the puerperium. If the faecal masses are low down in the sigmoid and upper part of the rectum, they may cause severe tenesmus, with a constant desire to defaecate, but nothing is passed when the bed-pan is given.

Coprostasis may cause stercoraemia, the pulse and temperature rising so high as to simulate sepsis about the third or fourth day, and if the abdomen is distended and tender to pressure, it may simulate the onset of peritonitis.

**Diagnosis.**—The facial expression is not that seen in puerperal sepsis, the uterus and adnexa are not tender to palpation, the lochia are not foetid, and the faecal masses may be felt in the descending colon or sigmoid.

**Treatment.**—Give repeated large doses of castor oil and enemata till the bowel is thoroughly emptied. When this is done, the temperature and pulse quickly fall. Sometimes the faecal masses are so large and hard that they must be broken up with the finger in the rectum.

## VI. Simple or Aseptic Thrombosis of the Lower Limbs.

This form differs from the septic thrombo-phlebitis described under puerperal infection, and to distinguish it, is called aseptic thrombosis of the lower limbs. It is not the result of infection, as the septic variety is a much more serious condition.

It may arise by the extension of a thrombosis which began at the end of pregnancy, or it may originate during the puerperium, primary thrombosis of the femoral vein being not uncommon in the later months of pregnancy or after childbirth.



**Cause.**—Too absolute rest in bed ; slow circulation ; some as yet unknown change in the blood. The thrombosis may begin primarily in the veins of the lower limb, or may spread to these from the uterus.

**Symptoms.**—The general symptoms are often slight, the pulse rate being little increased, and there may be no elevation of the temperature. The patient, however, complains of pain and numbness in the affected limb.

**Signs.**—Oedema begins towards the end of the first week about the ankle or foot, and extends upwards till the whole limb is swollen.

**Prognosis.**—This is, as a rule, favourable, though there is a risk of pulmonary embolism should a clot become detached. The symptoms, as a rule, abate in several days, but there is weakness in the limb for some time longer.

**Treatment.**—The patient should be kept at absolute rest in bed with the limb raised until all danger of embolism is past. After she leaves her bed the leg and thigh should be bandaged. Massage may be necessary if the affected limb remain weak, but this must not be carried out till all signs of thrombosis are quite gone.

## VII. Sudden Death in the Puerperium.

Death may arise from—

1. **Pulmonary Thrombosis or Embolism.**—A blood clot breaks off from a thrombus in the pelvic or femoral veins, and passes through the right heart to the pulmonary artery. It occurs during the first three weeks of the puerperium.

**Symptoms.**—If the clot is large enough to plug the whole artery or a large branch, the patient, who has been quite well, is seized with intense dyspnoea, and dies with tragic suddenness in a few minutes, before anything can be attempted for treatment.

If smaller branches are affected, there is great praecordial distress, intense dyspnoea, cyanosis, and a rapid feeble pulse. It is usually fatal in a few hours, although there is time to try stimulation by strychnine, digitalis, brandy, ether, ammonia, or oxygen.

A small embolism may cut off a part of one lung in which

pneumonia develops, causing a cough with rusty sputum. Recovery takes place, so the prognosis is good.

2. **Syncope** from cardiac disease, anaemia of severe haemorrhage, shock of exhausting labour. Treat by cardiac stimulants.

3. **Puerperal coma** from diabetes, eclampsia, cerebral haemorrhage.

### VIII. Puerperal or Reproductive Insanity.

This shows itself as mania or melancholia, and may occur during pregnancy, labour, the puerperium, or lactation. The majority of cases occur during the first fortnight of the puerperium, and it is commoner in primiparae. Predisposing causes are bad heredity, and prolonged mental or physical strain.

*Symptoms.*—The onset is usually sudden. The patient shows an unaccountable dislike for her child, the nurse, husband, relatives, or doctor. She is restless and *sleepless*. The pulse is weak, and the temperature rises. Then follows noisy mania (more commonly) or profound depression, and she may show suicidal or homicidal tendencies.

**Differential Diagnosis.**—Hysteria, alcoholism, or the mental disturbance of septicaemia must be excluded.

**Prognosis.**—70 to 80 per cent. recover; 50 per cent. of recoveries within three months, 90 per cent. within six months.

**Treatment.**—A special hospital for acute nervous affections, such as that in Duke Street, Glasgow, is most suitable, owing to the large percentage of speedy recoveries.

If the case is not suicidal or homicidal it may be nursed at home, provided skilled day and night nursing can be afforded. She must be isolated, and the child taken away.

### IX. Puerperal Infection or Sepsis.

**Definition.**—The majority of all febrile diseases during the puerperium are due to sepsis, so *puerperal fever* must be defined as a *wound fever* due to the *infection* of the *wounds* in the utero-vaginal canal from the introduction from without of various *micro-organisms*.

As the result of full-time labour there are injuries to



perineum, vagina and cervix, forming open wounds, but most important of all is the large raw surface or open wound left in the uterine cavity at the placental site after the separation of the placenta.

These wounds are a source of the gravest danger to every woman who has passed through labour, as they may readily become infected as the result of the introduction of septic organisms from without, occurring most often during labour as the result of vaginal manipulations; less often are the micro-organisms primarily introduced during the puerperium.

The serious risk that a woman runs from infection of the uterine cavity and placental site is also seen in incomplete abortion, when the retained pieces become septic, especially occurring in criminal abortion from the introduction of a sound without aseptic precautions, and leading to septicaemia which may end in death.

The uterine cavity during the puerperium is normally sterile, and is protected from the upward passage of infection from the vagina by the rapid formation of granulation tissue on the vaginal wounds, but if these wounds become septic ulcers the infection can spread upwards, aided by the lochia, which forms an excellent culture medium for organisms introduced during labour. In most cases, however, the germs are directly introduced into the cervix or uterus by the examining finger during palpation of the cervix and presenting part, during labour, or by instrumental interference to aid delivery, and it is all the more serious if lacerations of the cervix are directly inoculated during vaginal examination. Germs may also be directly introduced into the uterus by the douche tube. The gravest danger is incurred during manual separation of the placenta, as the fingers come in direct contact with the placental site. The patient may escape during labour, but may become primarily infected during the puerperium, though this will rarely occur if the woman is not examined or douched. The author has seen fatal results follow the introduction of sepsis from a uterine examination in the second week of the puerperium.

#### Etiology.

**Predisposing Causes.**—(a) *Conditions diminishing the Resisting Power of the System to Germs.*—1. The number and degree

of virulence of the micro-organisms. The more virulent the germ and the less resistant the tissue, the more rapid and the greater is the invasion.

2. Poorly nourished or anaemic women, or those who have suffered from previous ill health. This reduces the resisting power of the system, and the same condition arises in women who live in unhygienic surroundings, such as badly ventilated, badly lighted, and overcrowded rooms in poor localities, or in houses where the drainage system is at fault, permitting the escape of sewer gas into the rooms.

3. Exhaustion and depression after prolonged or difficult labour. The longer the labour the greater is the trauma from prolonged crushing of the tissues, and consequent reduction in their resisting power.

A prolonged labour also induces more frequent vaginal examinations, each examination increasing the risk.

Elderly primiparae, with rigid tissues, are more predisposed, as they more often require operative interference than young primiparae or multiparae.

4. Severe haemorrhage during labour or post-partum, causing acute anaemia.

5. Placenta praevia. The implantation of the placenta on the lower uterine segment brings the placental site near the cervix, so that it is more easily infected, especially as the manipulations necessary are conducted at the placental site.

6. Albuminuria.

(b) *Conditions favouring the Growth of Germs.*—1. Raw surface of the placental site, with its open blood vessels and lymph channels. This acts as an open wound, from which the toxins (sapraemia) or the germs themselves readily invade the system through the lymph vessels (septicaemia) or the blood vessels (pyaemia).

2. Lacerations of the vagina and cervix. The germs from these wounds may invade the broad ligaments by the lymph channels, and cause pelvic cellulitis.

3. The retention of portions of placenta, membranes or blood clot in the uterine cavity; the blood clots which form the thrombi occluding the uterine blood vessels and sinuses in the placental site; the lochia, especially if retained. All these form splendid culture media for furthering the growth of germs.



(c) *Conditions favouring the Rapid Absorption of Germs or their Toxins into the System.*—1. The enormously developed system of lymphatics in the uterine wall required for absorbing the effete products normally set free during the process of involution of the uterus equally favour the rapid absorption of germs or their toxins.

2. The thrombi in the blood vessels communicate directly with the blood stream, so that a septic thrombo-phlebitis can spread along the veins.

**Exciting Causes.**—In almost every case, the micro-organisms are introduced from without—**heterogenetic infection**—by one or other of the following means :

1. By direct inoculation from septic fingers, douche tube or instruments introduced into the vagina; or by septic diapers, clothing or bedclothes coming in contact with the vulva.

2. Fingers, instruments, or douche tube, although aseptic when used, may carry infection from a septic vulva or anal region with which they come in contact during introduction into the vagina; or the fluid of a vaginal douche may wash septic matter up into the uterus from the vagina. Pyogenic streptococci, diplococci and the bacterium coli commune are not infrequently present in healthy pregnant women, especially in the lower part of the vagina, while numerous germs are always present in the vulva.

3. Sepsis may be carried by doctor or midwife from other patients, and the most serious source is the infecting of a parturient woman from another case of puerperal fever. Cases occur of a midwife having several deaths running, every patient she attends dying from septicaemia.

Sepsis may also be carried by attending other patients suffering from septic wounds, abscesses, erysipelas, small-pox, diphtheria, quinsy, pneumonia, etc. A dangerous source of infection is attending a labour case shortly after performing an autopsy.

4. The sepsis may emanate directly from the attendant who may suffer from ozoena or other septic condition, or as in the case of a midwife who dressed an ulcer on her own leg and thus infected her patient by her soiled fingers.

5. A stitch abscess may form in a sutured perineum, the pus infecting the lochia, and the infection spreading upwards to the uterus.

As already stated above, most cases suffering from puerperal sepsis are infected during labour, the seat of implantation of the germs being most often the cervix and endometrium, less often the vulva and vagina. This is due to the examining finger being swept round the presenting part and estimating the size of the cervix by direct palpation over its whole circumference.

Primary infection during the puerperium is uncommon, if the patient is not internally examined nor douched.

**Autogenetic Infection.**—Gonococci may be lying latent in the genital tract, and assume a fresh virulence during the puerperium, the inflammation spreading upwards to uterus, tubes, ovaries and peritoneum. The germs frequently present in the vagina of healthy pregnant women may rarely ascend to the uterus, and this may account for sepsis in women who have not been examined during labour.

Peritonitis may also be caused by rarer conditions, such as the rupture of a pyosalpinx, or an ovarian tumour.

**Haematogenic Infection.**—Very rarely the germs may reach the uterus by the blood stream from an infective focus in some other part of the body.

#### **Bacteria causing Puerperal Infection.**

Any of the following varieties of micro-organism may be found, but in most cases of puerperal sepsis the infection is a mixed one, *e.g.* pyogenic cocci occurring with saprophytic or specific germs. In other cases, members of all groups may occur together.

(a) *Saprophytic or Anaërobic Putrefactive Organisms, e.g.*—*Bacillus aërogenes capsulatus*, *B. proteus vulgaris*, *B. septicus*. These do not, as a rule, attack living tissues, but develop on dead matter, such as retained pieces of placenta, membranes or blood clot, cause putrefaction and produce toxins which, being absorbed, cause *sapraemia* or putrid intoxication. The infection is a chemical one. The first of these may in association with streptococci produce generalized infection.

(b) *Pyogenic Organisms, e.g.*—*Streptococcus pyogenes*, more rarely *staphylococcus pyogenes aureus* and *albus* or *bacillus pyocyaneus*. These produce suppuration and sepsis. They pass into the lymphatics and blood stream, invade living tissue, injuring it both chemically and mechanically, and cause general



*septicaemia*. These germs are readily carried to the genital tract by direct inoculation from septic fingers, instruments, etc., from suppurating sores on patient, doctor, or nurse, from other cases of puerperal fever, etc. The streptococcus is the germ most frequently found in puerperal infection. In some cases it acts as a saprophyte, while in other cases it acts with great virulence, and this is especially the case if it has recently passed through the human body. This accounts for the very great danger when streptococci are carried from another patient suffering from puerperal infection or from another source of sepsis mentioned above under "Exciting Causes."

(c) *Specific Organisms, e.g.*—(1) *Diplococcus gonorrhoeae* from existing gonorrhoeal affections, *e.g.* vaginitis, pyosalpinx, and causing pelvic inflammation; (2) *Bacillus coli communis* carried from anus to vagina, causing peritonitis or general septicaemia; (3) *Pneumococcus*, causing peritonitis or general septicaemia; (4) *Bacillus diphtheriae*, causing formation of false membrane locally on vulva, vagina and cervix in which Loeffler's bacillus is found.

**General Pathology.**—When local infection occurs, the organism seeks to protect itself by forming a protective wall of leucocytes, which stream from the blood to the seat of invasion, while the cells in that region mass together. These together form the protective *reaction zone* or *granulation wall*, and it depends on this wall whether the infection will remain localized or spread further. If the germs are very virulent, or the resisting power of the cells is diminished, the granulation wall is poorly developed or is broken through, permitting the germs to penetrate the tissues and pass along the lymphatic vessels, and if localized, cause localized inflammations, but if the defence of the lymphatic system is broken through, the whole system is infected, and *septicaemia* results.

If the germs penetrate the blood stream, and this usually occurs at the placental site, they give rise to a *metrophlebitis*, and in severe forms of infection the thrombi undergo purulent softening. Portions of these purulent thrombi may become detached, and, being conveyed to other parts of the body, produce *pyaemia*. If the septic thrombo-phlebitis spreads along the veins downwards to the lower limbs it produces *phlegmasia alba dolens*.

In cases dying of *puerperal septicaemia*, almost constant

changes are found in the spleen, liver and kidneys, also less frequent changes in other organs, unless death ensues so rapidly that there is no time for these to take place.

The *spleen* is large and pulpy, and dark in colour from congestion.

The *liver* shows changes from cloudiness and fatty degeneration to almost complete destruction of liver cells.

The *kidneys* show cloudy swelling of the cells, with greyish yellow streaks, due to bacteria filling the urinary tubules, and causing necrosis of epithelium, and it may be pus formation.

The *heart* in advanced cases almost always shows fatty degeneration of the myocardium.

The *bowels* show inflammation of the mucosa, more rarely ulceration and necrosis. Haemorrhages frequently occur on the surface of the mucosa.

Less frequent conditions are abscesses in glands, connective tissue and muscle, small ecchymoses in many organs, cystitis, and infection of parotid and thyroid glands.

In *pyaemia*, septic thrombi are found in the uterine veins, spreading to the iliac and femoral, and even the inferior vena cava. Septic emboli are found in the kidneys and lungs, also in the liver, spleen and heart. Bacteria may settle on the cardiac valves, especially of the left heart, forming whitish yellow spots and thickening, which necrose and ulcerate. This is *ulcerative endocarditis*, which is invariably fatal. Ulcerative endocarditis causes septic emboli to be sent to all parts of the body, and frequently causes purulent meningitis and retinal haemorrhages.

## A. Local Infections of the Genital Tract and Pelvis.

### 1. Vulvitis and Puerperal Ulcers.

The vulva and lower vagina are oedematous, red and tender, the lacerations forming puerperal ulcers with raised, red edges. The surfaces of the injured parts are covered by a dirty, greyish yellow membrane, due to superficial necrosis, and contain numerous germs, especially streptococci and bacterium coli. The swelling begins between the first and third day.

In rare cases the infection spreads more deeply, and causes sloughing.



**Symptoms.**—The patient may complain of a burning pain in the vulva, the temperature rises to 101° F. or over, with increased pulse rate.

**Treatment.**—Bathe the surface with dilute antiseptic lotion, and swab the ulcers with tinct. iodi. or 10 per cent. carbolic acid in alcohol or glycerine, and keep the labia apart with iodoform gauze. If the perineum has been sutured, remove all the stitches.

## 2. Vaginitis.

The whole vaginal mucosa may be swollen and reddened, and puerperal ulcers may form, the discharge being foetid. Infection of deep lacerations may lead to sloughing, or even abscess formation.

**Symptoms.**—The temperature rises to 101° or 102° F., with symptoms of sapraemia. The lochial discharge is profuse and stinking. The condition is recognized by a speculum examination of the vagina.

**Treatment.**—The vagina should be douched twice daily, taking care not to carry infection into the uterus. The vagina is exposed by a speculum, and ulcers are swabbed with hydrogen peroxide and painted with tincture of iodine, or 5 per cent. alcoholic carbolic. The vagina is then loosely tamponed with iodoform gauze, or gauze soaked in formalin glycerine solution. Formalin ℥xv, glycerine ℥ij and water to ̄x. This is repeated twice daily till the areas are in a healthy condition.

## 3. Acute Endometritis and Metritis.

**Putrid Puerperal Endometritis.**—This is due to infection by the colon bacillus or saprophytic organisms. There is necrosis of the decidua and subjacent muscle, forming a greyish or greenish discoloured layer with a foetid odour. Beneath this layer is seen microscopically a well-marked zone of leucocytic infiltration (granulation wall), which forms a barrier to the germ invasion, so that symptoms of general infection are absent (Bumm).

**Septic Puerperal Endometritis.**—This is caused by pyogenic organisms. A greyish false membrane may form, but has *no* foetid odour; or the uterine wall may suppurate. The zone of leucocytic infiltration is not so marked as in above variety, and

forms a feeble barrier, so that the organisms invade the lymphatics and blood vessels, and cause general septicaemia. If the leucocytic zone is complete, which occasionally happens, only sapraemia arises.

**Acute Metritis.**—In both forms of endometritis the uterine wall is more or less inflamed. Rarely small interstitial abscesses may form.

**Symptoms.**—The general symptoms vary according to the infecting organism, and may be those of sapraemia, as in putrid endometritis, or septicaemia, as in septic endometritis. In other cases the infection is a mixed one.

The symptoms usually begin on the third or fourth day with chilliness or a rigor, and a rapid rise of temperature, it may be to 104° F. The pulse is 110 to 120. After-pains are present, and the uterus is tender to pressure. The lochial discharge is profuse and haemorrhagic, or brownish and slimy. If the infection is streptococcic, the lochia may have no foetor, but if saprophytic organisms or colon bacilli are present, the discharge is foul smelling.

A reliable diagnosis as to the infecting organism and nature of the endometritis can only be made by a digital exploration and bacteriological examination of the uterine cavity.

The presence of streptococci points to a septic endometritis, as also a high pulse rate of 120, temperature of 104° F., and acute onset.

If a putrid endometritis is present, other cocci and bacilli are present, and pulse and temperature are not so high. Typical forms of putrid endometritis occur with retained placental tissue, and this may be felt in digitally exploring the uterus.

**Prognosis.**—This is uncertain, and depends on the infecting germ and resisting power of the patient.

If the pulse and temperature are not high, and there is no abdominal distension, the symptoms abate in a few days under suitable treatment. If the pulse and temperature are high, and remain so in spite of treatment, and if meteorism increases and there is tenderness to pressure over the uterus and adnexa, the process is spreading and will terminate in septicaemia.

Suppressed or scanty lochia, with an empty uterine cavity, points to severe streptococcic infection.



**Treatment.**—In mild cases, with a temperature not exceeding 101° F., and with foetid lochia, treatment should be limited to vaginal douches, and escape of lochia promoted by the administration of half-drachm doses of ergot thrice daily. The patient should also lie in a reclining position to prevent retention of lochia in the upper part of the vagina.

If the temperature rises to 102° F. or over, and there is no vulvitis or vaginitis with puerperal ulcers to account for it, the uterus should be explored and treated.

Place the patient in the dorsal position, cut the vulvar hair short, and cleanse the vulva and vagina thoroughly. Then put on rubber gloves, douche the uterus with a mild antiseptic, and explore the cavity.

If placental tissue is found, this should be removed by the finger, aided if required by a large curette. Many, however, object to the use of the curette. The uterus should again be douched and loosely tamponed with sterile iodoform gauze, or gauze soaked in formalin glycerine solution. This is removed in twelve hours, and the uterus is again douched. Ergot should also be given thrice daily.

This treatment may suffice if the case is taken early, and the temperature and pulse soon fall. It is important to remember that the first douching may be followed by a rigor and an alarming rise of temperature, which soon falls again.

In streptococcic cases, with a smooth endometrium, the curette should on no account be used, as it breaks into the protecting zone. The uterus should be simply douched and packed loosely with gauze as above, which is removed in twelve hours. No further intra-uterine treatment should be carried out, as it is useless.

If there is any evidence of pelvic cellulitis or peritonitis, and retained placental tissue has already been removed, any intra-uterine treatment is absolutely contra-indicated.

#### 4. Salpingitis and Ovaritis.

The tubes and ovaries are usually involved as part of a pelvic peritonitis (see "5" under).

A gonorrhoeal infection, exceptionally a streptococcic, may pass along the tube and cause a pyosalpinx, which does not differ from that described in gynaecological text-books.

### 5. Acute Pelvic Peritonitis or Perimetritis.

The organisms reach the peritoneum directly through the lymphatics or along the tubes, or both.

**Pathology.**—The peritoneum of the uterus and adnexa is injected with cloudy swelling of endothelium, and fibrinous or serous fluid is poured out. The peritoneum may thicken from fibrinous deposit, and the exudation may more or less fill the whole pelvis, forming a hard tumour-like mass. Resolution may take place or adhesions may form, fixing and matting pelvic organs together and to bowel. Spaces may become shut off in which serous fluid collects, and thus simulates a cystoma. In severe cases pus may form (pelvic abscess).

Sometimes one or both tubes are affected, being thickened and oedematous, while the mucosa is eroded and covered with pus. If the fimbriated ends become closed, the pus collects and forms a pyosalpinx. The ovaries can also be affected, being congested and oedematous, and pus may form, leading to an ovarian abscess.

**Symptoms.**—The onset is usually, though not always, severe, and is ushered in with a rigor, a rise of temperature to 104° F., and a rapid, full-bounding pulse, which in severe cases is soft and irregular. Sometimes there is nausea, and may be vomiting. Severe pain is felt in the lower abdomen, which is distended. There is frequent and painful micturition and constipation, with painful defaecation. Sometimes there is diarrhoea. When pus forms there are symptoms of abscess formation, with high fever. The patient keeps her abdomen rigid, and lies on her back with both legs drawn up, though not always so.

**Diagnosis.**—Palpation shows the lower abdomen rigid, very painful and tender to pressure, and there is more or less tympanites. If the exudation is large, there may be dulness to percussion above Poupart's ligament.

Vaginal examination shows the vagina hot and tender. After exudation occurs you feel the vaginal roof *firm* and *board-like* and *cervix fixed*, as if plaster of Paris had been poured into the pelvis. In other cases the exudation may form a hard mass limited to and filling one lateral half of pelvis, and extending above the level of Poupart's ligament (peritubal exudation). When the acute stage is past and absorption begun, you may bimanually feel the annexa forming a mass



matted together and surrounded by exudation. At a still later stage, when this is absorbed, you may feel a dilated tube (sactosalpinx). If an abscess form, *e.g.* in pouch of Douglas, the mass enlarges and becomes fluctuant.

**Prognosis.**—The acute stage lasts one to two weeks or longer, according to the nature and severity of the infection, then the fever gradually subsides, unless suppuration occurs. *Results.*—(1) Gradual absorption of exudation, which may take several weeks. (2) Permanent adhesions between organs or displacements of uterus, tubes and ovaries. (3) It may become general and prove fatal (rare). (4) It may become purulent, and form intra-pelvic abscess, which ruptures into rectum (most usual), bladder, vagina or general abdominal cavity with fatal results. (5) Frequent relapses are characteristic of pyosalpinx.

**Differential Diagnosis.**—Between peritonitis and cellulitis, see below.

**Treatment.**—The patient must be kept lying on her back, and no intra-uterine treatment must be done. Give nourishing and easily digested liquid food at regular intervals. Ensure soft motions by saline laxatives. If a stimulant is required give strychnine. If pain is great give morphia suppositories; quinine gr. iij doses if an antipyretic is required. Hot fomentations or turpentine stupes to the abdomen relieve the pain. In acute cases, with effusion in the pouch of Douglas, posterior colpotomy and drainage may check further progress of infection. If pus form, open and drain per vaginam. When the temperature falls, and case is becoming subacute, favour absorption of exudation by hot saline douches, 110°-115° F. twice daily, and 15 per cent. ichthyol and glycerine tampons every second day left in for 12 hours.

## 6. Acute Pelvic Cellulitis or Parametritis.

This is an inflammation of the pelvic cellular tissue, by the direct passage of the infection from lacerations of the upper vagina or cervix or through the lymphatics from the placental site. The cellulitis begins in the neighbourhood of the cervix and spreads outwards, the commonest seat being the broad ligament and utero-sacral folds. It is usually unilateral, more rarely bilateral. The streptococcus is most often the infecting organism, but the staphylococcus or colon bacillus may be found, and rarely the bacillus *aërogenes capsulatus*, which

produces gas in the tissues. There is an exudation of serum and small cells to form a tumour mass containing streptococci and staphylococci (1) in whole or part of the broad ligament; (2) in the utero-sacral folds—parametritis posterior; (3) retro-cervical, pushing up the peritoneum of the pouch of Douglas; (4) between the cervix and the bladder or at the sides of the bladder, and it may pass up as high as or above the symphysis pubis, pushing the uterus backwards; (5) it may pass up into the connective tissue of the anterior abdominal wall as an extension from the broad ligament, and be felt above Poupart's ligament (parametritis anterior). The mass gradually absorbs, but suppuration occurs in many cases, forming a large abscess. In very acute forms a *diffuse cellulitis* may occur, which spreads retro-peritoneally, it may be as far as the kidney region, and is usually rapidly fatal from septicaemia.

**Symptoms.**—The symptoms begin about the third or fourth day, though it may be later, by a chill or sometimes a rigor, followed by fever and rapid pulse. It begins more gradually than peritonitis, and the pain is not so severe. The amount of pain depends on the extent of coexisting peritonitis, and is felt in the hypogastrium and affected side, and radiating down the thigh on the same side. There is also discomfort or pain during defaecation or micturition. If the exudation in the broad ligament extends to the neighbourhood of the psoas, the patient lies on her back with the leg of the affected side drawn up. If suppuration occur, the pulse remains fast, the temperature shows evening rises, and there is progressive emaciation, with pallor or earthy sallowness of skin. The patient looks ill, and shows marked debility and mental depression.

**Diagnosis.**—There is tenderness to pressure over the lower abdomen and affected side. If the exudation spread laterally and forward to the anterior abdominal wall, a hardness or resistance is felt above Poupart's ligament. *Vaginal examination* shows heat in the vagina and tenderness on pressing into the vaginal fornix. *Bimanually*, after exudation forms, a *fixed*, doughy, tender mass is felt in one of the situations mentioned under pathology, displacing the uterus to the opposite side. If low down in the broad ligament the mass bulges into the lateral fornix. In *utero-sacral cellulitis* rectal examination shows that the rectum is wholly or partly



surrounded by exudation. When pus forms, the mass gets *boggy* and larger.

*Chronic Parametritis*.—As the exudation absorbs and contracts the uterus is pulled to the same side, and bimanually the remains are felt in some cases as a dense hard mass, or there are cicatricial contractions of the ligaments pulling on and causing displacement of the uterus.

**Differential Diagnosis.**—(a) *Pelvic Peritonitis from Pelvic Cellulitis*.

- |   |   |
|---|---|
| 1. Inflammation in peritoneum, and often not definitely localized in one part of pelvis.  | 1. Cellular tissue mainly affected, and usually in distinctly localized areas.                                      |
| 2. Much commoner.   | 2. Not so common.   |
| 3. Swelling usually around uterus, generally fixing cervix. Does not bulge into lateral fornix and uterus is usually not displaced to side. | 3. Swelling felt as a localized mass to one side of uterus, which is often considerably displaced to opposite side. |
| 4. Exudation seems to round off, and finger feels as if it could pass between it and pelvic wall.   | 4. Mass feels as if it extended close to pelvic wall.   |
| 5. Tympanites in severe cases. Pain very severe.  | 5. None. Pain not so severe.  |
| 6. Marked abdominal tension and tenderness.   | 6. May be little tenderness or rigidity of abdomen.   |

(b) *Haematoma in Broad Ligament*.—Occurs suddenly with pain, faintness and *no* fever.

(c) *From Fibroid of Uterus*.—After the exudation reaches the non-sensitive stage it is harder and more irregular than a fibroid, and there is the above history.

**Prognosis.**—(1) The exudation may completely absorb and leave no trace. (2) It may remain many months, the mass getting stony hard and non-sensitive. (3) If absorption is slow the exudate may organize and cause cicatricial contraction of the ligaments, leading to their shortening, this leading to various displacements of the uterus, such as lateri-version, or the uterus is pulled to one side or upwards and backwards (pathological ante flexion) by the utero-sacral folds, which may constrict the rectum. (4) The exudate may suppurate and form an abscess, which usually points *above* Poupart's ligament, about the seventh to twelfth week. The abscess

may point in the vagina or rectum, or the pus may burrow in other directions, and point at the iliac crest, the sciatic notch, etc.

**Treatment.**—Keep the patient at absolute rest in bed, and avoid all local treatment. Maintain the strength by nourishing, easily digested, liquid food, and ensure soft motions by gentle laxatives only. Pain may be relieved by hot fomentations to the lower abdomen. When the fever goes and the exudate begins to absorb, vaginal douches and glycerine tampons are indicated.

Should the mass suppurate, open where the pus tends to point, and drain.

### 7. Acute General Peritonitis.

The infecting organisms spread by way of the retro-peritoneal lymphatics, or directly through the uterine wall. More rarely does a general peritonitis arise from a purulent gonorrhoeal salpingitis, or the rupture, during labour, of a pre-existing pyosalpinx or ovarian abscess. Other causes are rupture of the uterus, crushing of an ovarian cystoma or acute torsion of its pedicle, and rupture of an abscess due to appendicitis.

The streptococcus is most usually the infective organism, but others may be found. The changes found depend on the severity of the infection. In very severe types death ensues rapidly, and there is only found a small quantity of dirty, reddish fluid swarming with bacteria, especially streptococci.

In less virulent cases the serous membrane gets covered with a fibrinous exudation or sero-fibrinous or purulent. The bowel is paralysed, deeply congested and greatly distended with gas, the various coils being agglutinated.

Recovery is relatively rare, death being due to acute toxæmia or septicaemia, but in more subacute cases localised collections of pus may form and rupture into rectum, vagina or bladder, or through the abdominal wall. Cases that recover leave behind dense adhesions of the viscera.

**Symptoms.**—These may begin during the second or third day, or not till the fourth or fifth, or even later, when a rigor occurs with a rapid rise of temperature to  $103^{\circ}$  or  $104^{\circ}$  F. The temperature may be less than this, but most characteristic is the rapid pulse, which reaches 110 or 120, but in very severe cases may be 140 or 160.



The abdomen becomes very much distended, and is more or less painful and tender to pressure. Muscular rigidity is not a marked feature in puerperal cases.

The bowels are obstinately constipated, and not even flatus is passed, but later diarrhoea may set in. Vomiting is an early symptom, and towards the end of the disease coffee-coloured fluid is ejected with little effort on the part of the patient.

The tongue becomes dry, red or brownish, and fissured, and the patient suffers from intense thirst.

The face is pallid, with an anxious expression, and the eyes are sunken.

In some cases the patient is conscious to the end, in others she is slightly comatose or delirious, and the pulse is very rapid and difficult to count, it is so small and soft.

**Prognosis.**—The majority of cases die within four or five days, while virulent streptococcic infection is always fatal. The pulse is the best prognostic, the temperature being of less value. If the pulse remain over 140, and brown vomit occur, death is practically certain, and the nearer labour the symptoms begin the worse the prognosis.

**Treatment.**—This is practically hopeless in most cases. At the beginning an attempt may be made to try and move the bowels with calomel and magnesium sulphate, followed by a large enema. Saline enemata or continuous proctoclysis is valuable. The treatment otherwise is mainly symptomatic, strychnine and digitalis being given hypodermically every four or six hours when the pulse is rapid and weak. Laparotomy has not given good results in puerperal septic peritonitis, except in cases where there are encapsuled collections of pus.

### 8. Septic Thrombo-Phlebitis.

The organisms may penetrate the blood clot in the veins of the placental site and cause a metro-phlebitis, the streptococcus being the infecting agent in most cases.

In very virulent cases the clots suppurate and break down, the system becomes infected through the blood stream, and *pyaemia* results.

In less virulent cases suppuration does not occur, and the condition remains limited or it spreads into the veins of the broad ligament, and on to the iliac veins, and thence upward even to the vena cava.

In other relatively mild cases the septic thrombosis spreads downwards to the femoral vein, and causes *phlegmasia alba dolens*

### 9. Phlegmasia Alba Dolens—White Leg.

**Definition.**—A swelling of one, usually the left, or both lower limbs, characterized by pain, tension and whiteness of the skin. When the second limb becomes affected the thrombosis appears some days after the first onset, but it may not be for some weeks with a return of the symptoms.

**Cause.**—It is usually due to streptococcic infection giving rise to a septic thrombo-phlebitis in the pelvic veins, whence it spreads to the veins of the lower limb.

**Pathology.**—Two forms are described—(1) a septic thrombo-phlebitis, or *thrombotic form*, the usual variety, and (2) a *lymphatic form*, which is rare, but both may occur together.

In the *lymphatic form* there is no sign of femoral thrombosis, the swelling being due to obstructed lymphatics, and the glands in the groin may be enlarged and tender.

The *thrombotic form* begins between the tenth and twenty-first day with phlebitis and thrombosis of the main vein of the limb. It begins in the uterine veins, and spreads to the iliac vein and lower limb, so that the whole limb becomes tensely swollen.

**Symptoms.**—There is dull, aching, or severe pain near or along the line of the vein, beginning on the inner side of the thigh or in the calf, followed by swelling of the limb within twenty-four hours, and reaching its maximum in five or six days. A feeling of weight or powerlessness may be the first symptom complained of, or this condition accompanies the pain. There may be a rigor, and the temperature rises rapidly to 102° or 103° F., with a pulse of 100 to 110. The tongue is furred, and there is a loss of appetite and constipation.

**Signs.**—The swelling increases, and at first the cord-like veins may be felt. When the swelling is at its maximum the limb is much swollen, and the skin tense, white and shining, with the blue superficial veins showing through. The limb is more or less tender to palpation, chiefly along the veins. When the swelling is due to lymphatic engorgement the limb feels firmer and harder, and does not pit on pressure.



**Prognosis.**—Mild cases improve in four or five days, but in acute cases not for ten or fourteen days. The pain gets less and the tension relaxes, but the illness lasts six weeks or more. The progress of the case may, however, not be so favourable, and there may occur (1) organization of the thrombus and obliteration of the vein; (2) abscess formation or gangrene; (3) lameness and weakness of affected limb, or a chronic enlargement may follow lasting months or years; (4) the greatest danger is pulmonary embolism from detachment of a clot.

**Treatment.**—Absolute rest in bed. Raise the limb or the foot of the bed, and protect the limb by a cradle. Apply opium fomentations locally. If the pain is severe, control it by morphia. Give light strengthening diet, and regulate the bowels by laxatives. When the pain subsides, wrap the limb in cotton wool, and bandage it evenly from below up. Open abscesses if they form. Keep the patient in bed for a week after all the swelling, pain and tenderness have gone. If the affected limb remains weak it should be massaged, but this must not be done till several weeks elapse, and all signs of thrombosis are gone.

### B. General Infection.

Puerperal sepsis causing general infection usually arises from an infected uterus. The *placental site* is the most important seat from which the system is infected, as the blood vessels are directly exposed and filled with blood clot, which forms a suitable nidus for germs; while the lymphatics are greatly developed for the extra work in carrying away products of involution, and thus rapidly absorb the germs or their toxins.

There are three varieties:

1. Sapræmia.
2. Septicæmia.
3. Pyæmia.

#### 1. Sapræmia or Septic Intoxication.

**Definition.**—A general pyrexia due to toxic infection from the absorption into the system of the products—toxins—of saprophytic or sometimes of pyogenic organisms, causing putrefaction at the seat of infection.

**Symptoms.**—If infected during labour sapræmia commonly

appears about the *third* or *fourth* day. There may be a chill or rigor, followed by a rise of temperature to 100° to 102° F. In more severe toxaemia the temperature may reach 104° F. The pulse reaches 100 to 120. There are general malaise, headache, sleeplessness, flushed face, anxious expression and sweating. The lochia is usually foetid; if not foetid, there is probably a pyogenic infection. Tenderness may be noted on pressing over the uterus. Sometimes there is a scarlatinoid or measles-like rash.

**Prognosis.**—This is usually favourable, but if untreated sapraemia may pass on to septicaemia, or local inflammations occur. Involution of the uterus is delayed or arrested.

**Treatment.**—Thorough local disinfection usually suffices. Cut the hair from the vulva, and thoroughly cleanse the parts with aethereal soap solution, followed by an antiseptic, *e.g.* 1 per cent. lysol. Next thoroughly cleanse and douche the vagina. Again wash the hands, and, using a freshly sterilized intra-uterine catheter, thoroughly douche the uterus. Palpate the interior of uterus, and if there is retained placental tissue, remove all débris by the finger and curette. Finally douche the uterus again. See also treatment of "Putrid Endometritis," p. 316. Repeat the douching in twelve hours should the lochia again show foetor. Give ergot in ℥xxx doses thrice daily. The temperature and pulse usually fall to normal by the second or third day. If this treatment fail, the case is one of septic-aemia.

## 2. Septicaemia or Septicaemia Lymphatica.

The whole system is infected by the pathogenic organisms themselves passing along the lymphatics from the seat of infection, and thus entering the blood stream. Exceptionally the organisms penetrate directly into the blood vessels. Septicaemia is produced by various organisms (see "Exciting Causes," p. 310) or by mixed varieties, so the clinical types vary, depending on the variety, dose, degree of virulence of the germ or germs, as well as on the resisting power of the patient. The most virulent forms are streptococcic.

I. *Mild Septicaemia* has symptoms like sapraemia, but does not yield so quickly to treatment. If the lochia be not foetid, then probably only pyogenic organisms are present.

II. *Severe Septicaemia.*—The onset is acute, and appears usually *first to third* day, seldom *later than first* week.



**Symptoms.**—It is usually ushered in by a chill or rigor, the temperature rising rapidly to 103° or 105° F. In very severe, rapidly fatal cases the temperature may only be about 100° F. There is a rapid small pulse 120 to 130 or more. The pulse is the most valuable diagnostic; the temperature may show deceptive variations, but the pulse remains rapid and does not alter. Respiration is quick. The face is flushed, the tongue furred, and there is anorexia. There may be vomiting and diarrhoea. There are also severe headache, sleeplessness, rapid bodily prostration, depression, slight unconsciousness, or transient delirium.

**Local Signs.**—Frequently there is tenderness and pain over the uterus, but bimanually no pelvic inflammation is detected. The lochia may be foetid, but this is often absent in severe streptococcic infection. Meteorism is usually present, and may increase without the presence of peritonitis.

**Further Course and Progress.**—(1) *Fatal in Two or Three Days.*—This is seen in very acute cases. The patient has a very rapid pulse, and quickly collapses, there being no time for complications to arise. The majority, however, last longer.

(2) *Fatal in Six or Eight Days.*—The temperature varies, and may decline, but the pulse gets *more rapid* and *weaker*. The patient looks very ill. She has an anxious expression, the eyes are sunken, and the face has a greyish hue. Occasionally there is profuse sweating. Meteorism increases. Constipation sets in, and flatus may not even pass. The lips and tongue get dry and cracked. *Vomiting* is of *serious import*, and may be persistent and become *blackish*. The urine gets scanty. The lochia diminish or dry up. The milk secretion stops. The patient may now die, the pulse being very rapid, and the extremities cold. In other cases peritonitis sets in, marked by abdominal pain, nausea and vomiting, a pulse of 140 to 160, and rapid respiration. Consciousness may remain till near the end, or the patient becomes delirious or comatose, then collapses and dies.

(3) *Cases lasting longer than Eight Days.*—Various complications may now arise, such as pleurisy, pneumonia, pericarditis, joint affections, and abscess formation.

**Diagnosis.**—An absolute diagnosis can only be made by taking a swab from the uterine cavity and having it

bacteriologically examined; otherwise the diagnosis is made by excluding other possible causes of pyrexia, *c.g.* pyrexia due to copraemia; and possible attacks of other fevers, influenza, scarlet fever, measles, etc. All cases of pyrexia, especially during the first week after labour, should be regarded as sepsis, unless some other definite cause is found.

**Prognosis.**—About 30 per cent. of all cases are fatal, but if only the grave cases are included, probably from 60 to 70 per cent., the acute in a few days, *most usually during the second week*, rarely the third to sixth week. The earlier the onset, the weaker and more rapid the pulse, the worse the case. It is very grave if the pulse keeps over 120 or more, and if there is persistent vomiting, with a dry brown tongue. It is also very grave in alcoholics, or after protracted exhausting labour and great loss of blood. Recovery, if it take place, is usually slow, and leaves behind it subinvolution and other pelvic mischief.

**Prophylaxis.**—*During Pregnancy.*—The resisting power of the woman should be improved as far as possible by attending to the general health as mentioned under the “Hygiene of Pregnancy.” She should have plenty good nourishing food, take sufficient open-air exercise, and live in well-ventilated rooms. Baths should be taken regularly, and the vulva kept clean by washing. The bowels and kidneys should be attended to, and especially towards the end of pregnancy when constipation is usual a thorough daily evacuation of the bowel should be ensured by laxatives if need be.

If the patient is anaemic, iron tonics should be prescribed, and any local pathological condition of vulva or vagina should be thoroughly treated.

Coitus in the last months of pregnancy should be absolutely forbidden.

*During Labour.*—Labour must be conducted with absolute asepsis and antisepsis in every thing connected with it, as already detailed under the “Management of Labour.” The hands of doctor and midwife are the most dangerous sources of carrying infection, and the medical attendant must be specially careful not to carry sepsis from some other case he may be attending (see “Causes of Puerperal Infection”). All swabs and towels, which are used for the vulva or hands, must be sterile. Vaginal examinations must be limited, as far as possible,



and scrupulous care taken when operative interference is necessary.

The management of the third stage of labour is very important. It should not be unduly hastened, to avoid the risk of leaving portions of placenta or membranes behind.

Manual separation of the placenta is especially dangerous, and is never lightly to be undertaken, or without full appreciation of the great risk to the patient.

*During the Puerperium.*—Injuries to the perineum should always be sutured. The vulva should be kept clean by a nurse, who fully realises the importance of surgical cleanliness, and kept covered by a sterile pad. See “Management of Puerperium.”

**Treatment.**—This is both local and general.

*Local Treatment.*—Puerperal ulcers and endometritis should be treated as described under “Vulvitis, Vaginitis, and Endometritis.” Douches are also necessary if the lochia are foetid, and retained placental tissue must be removed, otherwise no intra-uterine treatment must be done, as it is harmful.

Ergot acts locally by promoting contractions of the uterus, and should be given in ℥xxx doses thrice daily.

*General Treatment.*—The patient’s strength must be maintained by frequent easily digested liquid nourishment, *e.g.* meat juices, plain or peptonised milk, egg, or other albuminoid preparations, strong soups, etc.

*Vomiting.*—Give ice to suck or swallow, and small quantities of cold food. If this is not retained, nutrient enemata are necessary.

*Stimulants.*—Brandy or whisky, one or two tablespoonfuls, well diluted, every two hours is good, and is indicated if there is cardiac weakness. If necessary, judged by the state of the pulse, give hypodermics of strychnine gr.  $\frac{1}{30}$  and digitalis gr.  $\frac{1}{100}$  every six hours or oftener if required.

*Baths.*—Tepid baths once or twice daily for three to seven minutes, or failing these, tepid sponging or the tepid pack are very valuable, not only for high fever, but for improving the general well-being of the patient.

*High Fever.*—Tepid sponging. Quinine hydrobrom. gr. iij to v may be given every six hours, others prefer pyramidon or phenazone, as quinine may impair the appetite.

*To Eliminate the Toxin.*—Copious fluid is necessary, and

should be given by rectal salines, continuous proctoclysis, or subcutaneous infusions. These improve the pulse and lessen thirst.

*To Counteract the Toxin.*—Antistreptococcic or polyvalent serum may be tried in the early stages of the disease, though it has given little, if any better result. It should not be repeated if no benefit results from the first injection.

**Symptomatic Treatment** is also necessary, such as trional or veronal for sleeplessness, compresses over the abdomen for pain or meteorism, castor oil for constipation.

Diarrhoea should not be checked, unless it cause exhaustion, when it may be necessary to check it by opium.

Complications, such as peritonitis and pleurisy require appropriate treatment, while abscesses or joint affections require surgical treatment.

If the illness is a prolonged one, the nurse must guard against bed sores forming.

Hysterectomy has been tried, but as we cannot say whether the infection is limited to the uterus or not, such an operation is not justified. In any case the results have not been encouraging.

### 3. Pyaemia—Thrombo-phlebitic Bacteriaemia.

This condition begins as a septic thrombo-phlebitis of the veins in the broad ligament, due to the micro-organisms, most commonly streptococci, penetrating and infecting the blood-clot in the open veins of the uterine wall at the placental site. The thrombi suppurate and break down, so that the system becomes secondarily affected by means of septic emboli, causing metastatic abscesses in the various organs to which the emboli are carried. From the metastatic abscesses the toxins or the germs themselves are anew absorbed into the circulation.

Mixed forms of pyaemia and septicaemia are frequent, the system being infected both by the veins and lymphatics.

The septic emboli are found especially in the kidneys, lungs, liver, spleen, and heart. They may also be carried to joints, and cause inflammation and pus formation. Ulcerative endocarditis is a frequent complication, and when it occurs septic emboli are carried from the heart to every possible organ, causing small focal abscesses.



**Symptoms.**—As a rule, the onset is later than with septicaemia, beginning at the end of first week, or more usually during the second week, as some time is required for the thrombi to suppurate and break down.

The disease begins with a severe rigor and rapid rise of temperature to 104° F. or over, with a corresponding rise in the pulse to about 120, or even much higher in severe cases. This is followed by very profuse sweating and a fall of temperature, it may be to normal, during which the patient has a great thirst.

The great characteristic of pyaemia is the repetition of these rigors at irregular intervals. There may be one or two in the twenty-four hours, or a day or two may be missed between a succession of rigors, during which the temperature remains above normal. When metastatic abscesses form, symptoms are added according to the organs affected, and the pulse and temperature remain higher.

The kidney condition is shown by albuminuria, scanty urine, and it may be haematuria; the lung condition by pleuritic pains, and cough with blood-stained sputum. Ulcerative endocarditis is the worst complication, as it is invariably fatal, and occurs in more than half of all fatal cases. It causes numerous rigors, the pulse remains rapid, and the patient becomes restless, sleepless, with delirium and coma. Meningitis is frequently shown by headache, rigidity of the neck, increased reflex irritability, and a difference between the two pupils. Retinal haemorrhages occur in many cases.

**Prognosis.**—This is always grave, more than half of all cases ending fatally, while nearly all severe cases end fatally. Death may occur in two or three weeks, but others may linger for two months before proving fatal.

**Treatment.**—The general measures to be adopted are those described for septicaemia. Tepid sponging is valuable, but baths must not be given, as absolute rest is essential to diminish the risk of the detachment of septic emboli from the pelvis.

Vomiting is not usual, and advantage should be taken of the thirst following a rigor to administer liquid nourishment.

Should abscesses occur in joints or the subcutaneous tissue, they must be freely opened and drained.

Ligature of the affected pelvic veins in thrombo-phlebitis has

been done with good results in some cases, especially of chronic pyaemia, but with our present knowledge it is impossible to say when this operation is justifiable.

### **X. Gonorrhoea.**

A gonorrhoea existing during pregnancy becomes more active during the puerperium, and a characteristic of the disease is the late date of the onset of symptoms; indeed, these may not appear till after the patient has left her bed on the tenth day. The gonococci spread upwards, causing endometritis, salpingitis, and pelvic peritonitis, and should this occur early in the puerperium it may be difficult to distinguish from local wound infection due to pathogenic organisms.

**Diagnosis.**—The condition may be suspected during pregnancy should the patient complain of a copious purulent leucorrhoea, but in other cases it is not suspected until the child develops ophthalmia neonatorum. If the child's eyes have been prophylactically treated, the first suspicion of gonorrhoea may only arise when local pelvic symptoms show themselves. These are not, as a rule, so severe as in puerperal sepsis, and a point in favour of gonorrhoeal origin is a late onset in the puerperium. Gonococci are difficult to detect in the lochia.

**Treatment.**—If suspected during labour the vagina and vulva must be thoroughly cleansed, and the child's eyes prophylactically treated with silver nitrate or protargol, as already described in the "Management of Labour."

The patient should be kept longer in bed than usual, even when no febrile symptoms are present, and all douching must be avoided during the puerperium, to avoid the risk of washing the gonococci upwards into the uterus.

If salpingitis and pelvic peritonitis arise, the treatment is that described under "Pelvic Peritonitis."



## PART VIII.

### OBSTETRIC OPERATIONS.

#### I. Introduction.

**Position of Patient.**—The left lateral position is the one usually adopted in this country for a forceps case, but for difficult forceps cases, or where the hanging-leg position is likely to be required, as for flat pelvis, the dorsal position is better. For all other operative procedures the patient should be in the dorsal position.

**Dorsal Position.**—The patient is placed lying across the bed, with the nates at the edge, and the legs are held flexed by an assistant or are placed hanging over the backs of two chairs. This is the *cross-bed position*. A good method, when assistance is limited, is to place the patient in the *oblique-bed position*, in which she lies diagonally across the bed, with the nates at the edge and one leg lying along the side edge of the bed, while the other leg is placed hanging over the back of a chair.

In many cases it is much more convenient to place the patient on a table if enough assistance is at hand, especially when the patient is being confined in that most objectionable contrivance—a box bed.

**Preliminaries.**—Before undertaking any operative procedure, the most thorough asepsis and antisepsis must be observed, and the bowel and bladder must be emptied. The hair on the labia must be cut short. It is not necessary to cut the pubic hair for minor operations, but for major operations the whole region should be shaved. Now wash your hands and thoroughly cleanse the whole vulva and neighbouring parts with aethereal soap solution, followed by swabbing with an

antiseptic. The vagina is then swabbed and douched with an antiseptic, such as creolin or lysol 1 per cent.; as mercurial lotion is too astringent to the parts.

The uterus is also douched with 1 per cent. lysol previous to post-partum intra-uterine manipulation, with saline if the uterus is ruptured.

All instruments likely to be required are boiled.

After completing the preparation of the patient, again antiseptically cleanse the hands and also the forearms; and if the hand is likely to be put into the uterus, boiled rubber gloves should be worn.

After delivery douche the uterus, especially if the hands have been in the cavity, and more especially if the foetus is dead.

## II. Tamponade of Vagina.

**Indications.**—1. Inevitable abortion and haemorrhage profuse, especially if the cervix is closed.

2. Placenta praevia and cervix not dilated enough to permit of version.

3. Accidental haemorrhage. Rotunda method for the class of case where the pains are feeble or absent, the membranes are intact and the os not much dilated.

**Method.**—Place the patient in the cross or oblique-bed position, and carry out the preliminaries described above. Take pieces of aseptic cotton wool or gamgee, which are about walnut size when wrung out of 1 per cent. lysol. Gauze is not effective.

Use two fingers of one hand to act as a speculum, and receive the pledgets, and pack them into the vagina. First pack the pledgets into the fornices round the cervix till they are full, then fill the rest of the vagina.

The packing should not remain longer than twelve hours, when it must be removed, if not indicated sooner, and the vagina douched. If necessary, the tamponade can be repeated.

Removal of the pledgets is facilitated if they are tied together kite-tail fashion with sterilized string.



### III. Tamponade of Uterus.

- Indications.**—1. Bleeding after abortion to check haemorrhage.  
2. Post-partum haemorrhage if other means fail to check bleeding.  
3. Rupture of the uterus to check bleeding or for drainage.  
4. After reducing an inversion of the uterus to prevent a relapse.  
5. Severe laceration of the cervix if not sutured and haemorrhage is profuse.  
6. Certain cases of septicaemia to act as a drain in septic endometritis.

**Methods.**—Cross or oblique bed for patient, and preliminaries as above p. 332.

1. For *post-abortion haemorrhage*, pass a spatular speculum, pull down and fix the uterus with a volsellum attached to the anterior lip, and with uterine forceps pack the uterus full to the fundus with sterile ribbon gauze one inch wide. If required, tampon the vagina as described above p. 333.

2. For *post-partum haemorrhage* no speculum is required, as the uterus can be pulled sufficiently well down by volsella attached to each lip of the cervix. Take four to six yards of sterile gauze about four inches wide and four layers thick. Fix the fundus uteri with the outer hand to make sure that the gauze is packed well up to the fundus and no space left into which haemorrhage could occur. Special care must be taken not to let the gauze trail over the anal region during introduction.

Finally, the vagina is packed with pledgets of wadding, as described above. The gauze is removed in 24 hours and the uterus douched.

3. For *septic endometritis* the uterus is loosely packed with iodoform gauze or gauze soaked in formalin glycerine solution, 1 in 300. It is removed in 12 hours and the uterus repacked.

### IV. Interruption of Pregnancy.

1. **Induction of abortion** means the interruption of pregnancy before the end of the seventh month and before the child is viable.

2. **Induction of premature labour** means the interruption of pregnancy after the seventh month when the child is viable and before it has reached full time.

### 1. Induction of Abortion.

This must only be undertaken after careful consideration, and should never be done without calling a medical colleague in consultation.

**Indications.**—1. Toxaemic pernicious vomiting.

2. Severe cases of pregnancy kidney with threatened eclampsia.

3. Chorea.

4. Chronic nephritis; pyelitis (rarely necessary).

5. Severe cases of heart disease if compensation is failing.

6. Hydatidiform mole.

7. Hydramnios.

8. Incarcerated retroflexion of the gravid uterus if reposition fail.

(a) **Methods before mid-term.**—The antiseptic precautions must be very strict.

1. Puncture the ovum with a sound. This is slow, and may take one or two weeks to act. There is also a great risk of its becoming a septic abortion.

2. Introduce a laminaria tent into the cervix. This dilates the cervix and starts abortion.

3. Partly dilate the cervix and tampon the lower uterine segment and cervix with sterile gauze. This may induce contractions in a few hours.

4. If the cervix is easily dilatable the uterus may be emptied at one sitting under chloroform anaesthesia.

(b) **Method after mid-term.**—This is the same as for induction of premature labour.

### 2. Induction of Premature Labour.

**Indications.**—*Mother.*—1. Contracted pelves. Flat pelves not below  $2\frac{7}{8}$  ins. Justo-minor not below  $3\frac{1}{8}$  ins. Induction will be preferred in general practice to pubiotomy or caesarian section where skilled surgical aid is not easily obtainable. The foetal mortality is high; so, if the child is the first consideration, the pregnancy should be allowed to go on to full time, the



patient being previously transferred to a town where operation can be performed.

2. Tumours of the pelvis or soft parts will rarely be an indication, operation being the correct treatment. (See treatment of ovarian tumour, fibroid of uterus, cancer of cervix, cancer of rectum, and deformed pelvises.)

3. Complicated pregnancy, (*a*) chorea (rare); (*b*) pernicious vomiting (rare in late pregnancy); (*c*) threatened or actual eclampsia; (*d*) pyelitis (rare); (*e*) placenta praevia; (*f*) accidental haemorrhage; (*g*) hydramnios.

4. Threatened death from phthisis or cardiac disease, and done in the interests of the child to avoid a post-mortem caesarian section.

*Foetus*.—(*a*) Abnormally large children. If labour is induced a few weeks earlier, the birth will be natural. A rare indication.

(*b*) Where the child gets hydrocephalic or habitually dies before the end of pregnancy. Syphilis, or other obvious cause, must be excluded.

**Dangers.**—*Mother*.—There is increased risk from shock, injury to soft parts, and sepsis, depending on the amount of interference and the method selected.

*Child*.—1. The age may be *miscalculated*, since mistakes are easily made in estimating the probable duration of pregnancy from the size of the uterus. It may be unduly enlarged from plural pregnancy or excess of liquor amnii, or it may appear larger from undue protuberance of the abdomen, characteristic of deformed pelvis.

The patient may have had a haemorrhagic discharge corresponding to the menstrual period during the first or second month, so that an estimation of the duration of pregnancy from the date of the last menses may cause an error of one or two months. The child may also be larger than the average size.

Labour may thus be induced too soon, and if the child is born before the thirtieth week it seldom lives. If induction is performed too late the premature child readily succumbs under a difficult labour.

2. *Malpresentation* is more frequent than at full-time labour, so there is increased risk to the child during delivery.

The foetal *mortality* is high, averaging about 40 per cent.

**Preliminary Considerations.**—Premature labour is most often done for deformed pelvis, so accurate measurements of the pelvis should be taken. The period of gestation must also be calculated as accurately as possible, as labour must be induced as late as possible after the thirtieth week (see remarks above "On Danger to Child from Miscalculation"). Since the child's head is the best pelvimeter, the most accurate way to determine the correct date for induction is to note the day when the head can no longer be made to engage in the pelvic brim. The method is as follows: Place the patient in the dorsal position on a couch, or in the cross-bed position. If necessary, give an anaesthetic to cause complete relaxation. If the child is not presenting by the head it must be turned, otherwise the method is useless. An assistant presses on the fundus uteri to force the head into the pelvic brim, while the examiner grasps the foetal head through the abdomen with his right hand and pushes it into the brim. Then, with two fingers of the left hand in the vagina and the thumb externally over the symphysis pubis, he bimanually estimates how much of the head is above the brim.

So long as the head can be pushed into the pelvis—wait, but when the date arrives that it can no longer be made to enter the brim, then induce labour. A consultation should be held before inducing labour.

As the child is premature it may be advisable to have an incubator ready, and means should be kept at hand for resuscitating the child after delivery.

### **Methods of Inducing Premature Labour.**

(a) **Slow Methods.**—The case is not urgent, as where the indication is a deformed pelvis or hydramnios. Many methods have been advocated, but as they are now obsolete, it is needless to mention them.

The three methods for starting labour are by the hydrostatic bag, the bougie, and for cases of hydramnios puncture of the membranes.

*Hydrostatic-bag Method.*—A rubber bag, such as de Ribes', is used, and although labour is frequently induced within twelve or twenty-four hours, in some cases the uterus is so tolerant that it may be days before proper pains commence.



Empty the bowel and bladder, place the patient in the dorsal position, anaesthetise her, and carry out preliminary disinfection of operator, patient and instruments as detailed on p. 332. First dilate the cervix with bougies or a branched dilator till open enough to admit the bag, then with the finger separate the membranes from the lower uterine segment for a short distance. The bag is now introduced with forceps till



FIG. 114.—INDUCTION OF PREMATURE LABOUR BY THE HYDROSTATIC BAG METHOD.

it lies in the lower uterine segment beneath the membranes (Fig. 114). This can be done by the sense of touch, though some recommend that the vagina should be opened by a spatular speculum and the cervix fixed with a volsellum.

Now pump in sterile water, but do not use an antiseptic, in case the bag should burst. The capacity of the bag must have been previously tested to avoid the danger of over-distending it, and only use a syringe to inject the definite known quantity of fluid, which should not quite fill it. A bag,  $3\frac{1}{2}$  ins. in diameter at the top, takes about eleven ounces.

The vagina may now be loosely packed with gauze.

After the labour pains have been in progress for five or six hours, an examination should be made to note the extent of dilatation. If the os is well dilated remove the bag, otherwise leave it for some hours longer and draw off the urine by catheter every six hours to prevent over-distension of the bladder. If dilatation be too slow, or the condition of the patient demand haste, aid dilatation by traction on the bag.

After the bag is removed, examine to note the presentation, and, if need be, correct a malpresentation.

The labour is left to nature, or if indicated, is ended by forceps or version.

The bag method is not free from danger, as it has been responsible for rupture of the uterus.

*Krause's Bougie Method.*—This method is simpler, but is much slower, as it may take from one to three or more days to start labour, and may even fail in rare cases.

The patient is placed in the lateral or dorsal position, and the antiseptic precautions detailed on p. 332 carefully observed. An anaesthetic is not necessary.

Take a new No. 12 solid gum elastic bougie, made sterile by rubbing it with gauze moistened in 1-1000 mercuric biniodide solution, and by soaking it for several minutes in the same lotion.

Guided by two fingers placed against the cervix, slowly insinuate the bougie between the membranes and uterine wall for seven or eight inches (Fig. 115). Be gentle, and do not rupture the membranes. Should bleeding occur, the placenta is probably injured, so withdraw and pass the bougie in another direction. Keep it *in situ* by an iodoform gauze tampon in the vagina. Withdraw the bougie in twenty-four hours, douche the vagina, and if labour has not begun insert a new bougie. Two or three may be passed in different directions to hasten matters. If labour begins leave the case to nature if there is no urgency, and all goes well. The bougie is removed when the os is half dilated. Examine for possible malpresentation, and if need be correct it. If the os dilates too slowly, or if speed is required, then the cervix must be dilated with the fingers, de Ribes' bag or Bossi's dilator (see p. 341).

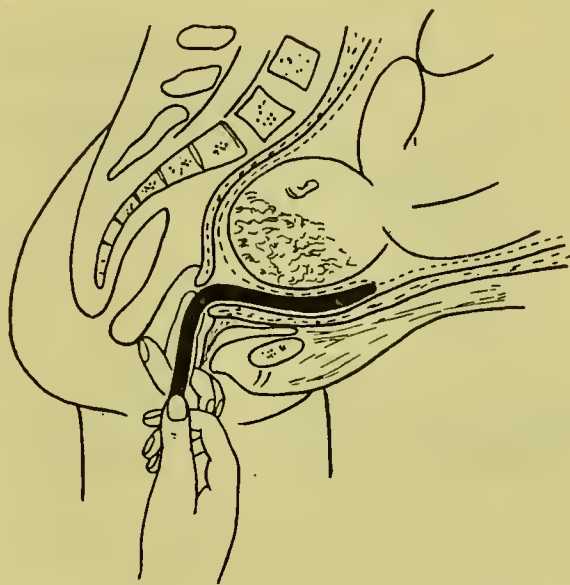


FIG. 115—INDUCTION OF PREMATURE LABOUR BY KRAUSE'S BOUGIE METHOD.

Passing the Bougie between the Membranes and the Uterine Wall.

*Rupture of the Membranes.*—This is only done for hydramnios. A sound is pushed through the membranes high up, and the liquor amnii allowed to drain slowly away. If dilatation goes on slowly it may be necessary to artificially dilate, especially if there are indications for speedy delivery.

(b) **Rapid Methods.**—The case is urgent, as where the indication is eclampsia or concealed accidental haemorrhage with a closed cervix.



Labour is started by dilatation of the cervix,

(a) With the fingers, when the cervix has been opened sufficient to admit the forefinger and thumb (see p. 340).

(b) With branched dilators, such as Bossi's (see p. 341).

(c) The uterus is emptied by vaginal hysterotomy (see p. 343).

*Accouchement forcé*, which consists in forcible rapid dilatation of the cervix, and rapid extraction of the child by forceps or version, is exceedingly dangerous both to mother and child, and has been largely replaced by vaginal hysterotomy, or by caesarean section, especially when skilled surgical aid can be obtained.

## V. Dilatation of the Cervix.

**Indications.**—1. To ensure rapid dilatation and delivery when the child's life is endangered.

2. For induction of premature labour, as a preliminary to the bag method.

3. To open the cervix sufficiently in placenta praevia to permit of the introduction of a hydrostatic bag, or the performance of bipolar version.

4. To induce labour and hasten dilatation in eclampsia and accidental haemorrhage.

5. To dilate the cervix and stimulate the pains in primary inertia uteri.

6. To dilate a rigid cervix where simpler means fail.

7. Posterior sacculation of the uterus.

### 1. Digital Method.

General anaesthesia is necessary, and the patient is placed in the dorsal position.

Rigid antisepsis must be observed, as detailed on p. 332. Rubber gloves are an extra protection.

The cervix must be sufficiently soft to yield to the fingers, and, if closed, it must first be dilated with bougies or a branched dilator till two fingers can be passed.

*Harris' Method.*—The thumb and index finger are inserted, and the cervix stretched by working them apart. Then, as space permits, successive fingers are introduced till the whole hand can pass. This method takes from thirty to sixty minutes, if the cervix is not too rigid.

### 2. Hydrostatic-bag Method.

De Ribes', or a similar rubber bag or metreurynter, is used. The method of introduction has already been described under



FIG. 116.—DE RIBES' HYDROSTATIC BAG.

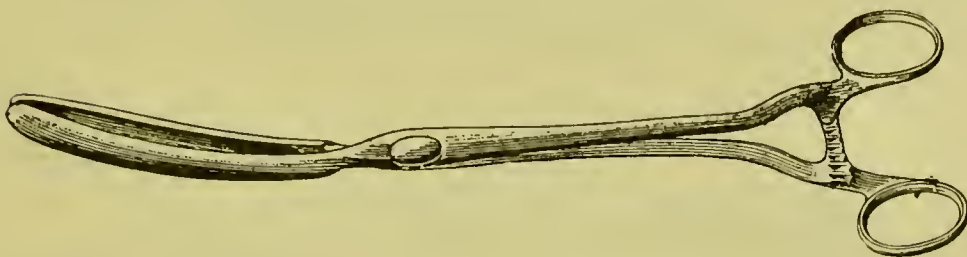


FIG. 117.—FORCEPS FOR INTRODUCING DE RIBES' BAG.

“Induction of Premature Labour,” p. 337. Its presence excites or stimulates the uterine contractions, and is therefore useful in primary inertia uteri.

Dilatation is hastened by traction on the bag.

### 3. Branched Dilators.

There are various patterns of these dilators, such as Bossi's (Fig. 118), Frommer's (Fig. 119), and de Seigneux' (Fig. 120).

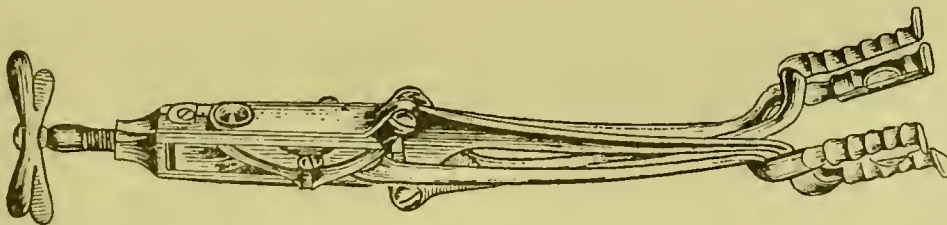


FIG. 118.—BOSSI'S DILATOR.

They can effect dilatation in from twenty-five to fifty minutes, but they are *dangerous instruments*, and by many condemned, as they may cause severe lacerations, or even rupture of the uterus if carelessly used.

They can be used with a closed cervix to induce premature labour, and it is in such cases that they are most *dangerous*.



They act most efficiently when the cervix is *already taken up* as far as the external os, when they may be introduced to hasten further dilatation in urgent cases. Anaesthesia and rigid antisepsis are necessary, as detailed (p. 332).

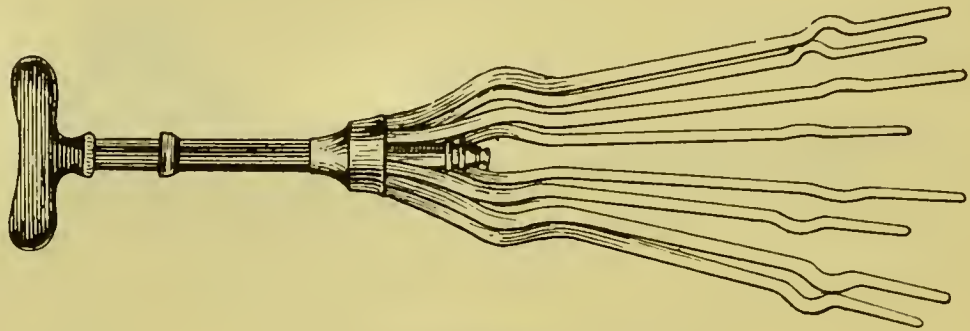


FIG. 119.—FROMMER'S DILATOR.

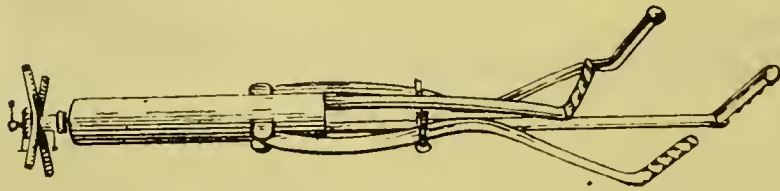


FIG. 120.—DE SEIGNEUX' DILATOR.

The points of the dilator are guided through the cervix, and dilatation effected by turning the screw which opens the blades, but this must be done very gradually, taking plenty of time. Extreme caution must be exercised, the effect of each partial turn of the screw being carefully noted and lacerations avoided. A slight tear may be extended to a rupture of the uterus if there is any carelessness, and the cervix dilated more rapidly than it can yield.

#### 4. Incisions of the Cervix.

**Indications.**—(a) Cicatricial or rigid cervix if the finger, bag or dilator fail. (b) Atresia of the cervix. (c) To aid dilatation in inoperable cases of cancer of the cervix if this will give sufficient room. (d) Where the cervix has contracted round the neck of the after-coming head, and the child is still alive, and the finger has failed.

With a knife or curved scissors make multiple small incisions round the cervix, or a deep incision on each side laterally and backwards.

An anterior incision is made in anterior sacculum of the uterus.

The great danger of this method is that the descending head

may further extend the incisions as tears into the fornix, with resulting severe haemorrhage, if the vaginal branch of the uterine is injured. Such tears should be sutured.

### 5. Vaginal Hysterotomy or Vaginal Caesarean Section.

The cervix and lower uterine segment are incised in the middle line, and the child delivered per vaginam. The *pelvis* must be *normal*. It is not an operation to be recommended to the general practitioner, who will prefer the slower methods of dilating the cervix.

**Indications.**—1. Grave eclampsia.

2. Abnormal conditions of the cervix and lower uterine segment due to (*a*) cancer, (*b*) fibroid, (*c*) rigidity, (*d*) stenosis, (*e*) posterior sacculation of the lower uterine segment, and (*f*) anterior sacculation following vaginal or ventro fixation of the uterus.

3. Dangerous conditions in the mother, which may be relieved by prompt emptying of the uterus, such as affections of the heart, lungs or kidneys.

4. Concealed accidental haemorrhage with closed cervix.

5. Where maternal death is imminent and can be foreseen.

6. It is still disputed as to whether the operation is justified for the sake of the child's life alone when it is endangered from prolapse of the cord or delayed labour in the first stage, the cervix being unyielding, and speedy extraction imperative.

In any case such a procedure could only be considered in a hospital, where everything is at hand for an immediate operation when called for.

**Operation.**—The bowel and bladder are emptied, and the anaesthetised patient placed on a table or in the cross-bed position. The usual antiseptic precautions are carried out as described on p. 332.

If required the vagina is first dilated manually or enlarged by a deep perineo-vaginal incision about two and a half inches long in the right vaginal sulcus, and deep enough to sever the right levator ani muscle. This wound is sutured again after delivery is completed. A metreurynter is inserted into the lower uterine segment, and the cervix pulled into reach by traction on the tube of the bag. A longitudinal incision is made in the anterior vaginal wall from the anterior fornix to about one inch short of the meatus urinarius. The anterior



fornix is then incised transversely for about two inches, and the bladder stripped off with gauze up to the peritoneal fold. The anterior lip is now divided in the middle line with scissors for about three and a half inches without rupturing the membranes. If more room is required, the posterior lip is split in like manner, as the opening must be large enough to admit a large-sized fist.

The membranes are now ruptured, a foot seized and drawn down, and the child extracted. The placenta is manually removed, after which the wounds are sutured with catgut, and a drain inserted if advisable.

If the operation is done for an operable cancer, the uterus is removed by vaginal hysterectomy as soon as the child and placenta are delivered.

## VI. Expression.

It is also called Kristeller's expression.

This is a method for aiding delivery by manual pressure on the fundus uteri.

**Indications.**—1. To force the foetal head against the cervix with the object of exciting pains in primary inertia of the uterus, the membranes having prematurely ruptured.

2. To express the child in delayed advance of the head at the outlet, owing to weak pains in multiparae, or for delayed birth of the shoulders after the head is born.

3. To aid the birth of the second twin, the passages being already dilated by the first.

4. To assist extraction of the after-coming head, especially in deformed pelvis.

**Method.**—Stand facing the feet of the patient, who lies on her back, close to the edge of the bed.

Lay both hands flat, with thumbs to front, on the sides of the uterus, the wrists almost touching over the fundus. Press downwards, and simulate the pains by beginning gradually, then increasing to the maximum pressure, and then diminishing. Each expression lasts several seconds, and is repeated at short intervals, the position of the hands being slightly changed each time.

If aiding extraction of the after-coming head, keep up the pressure till the operator has delivered the head.

## VII. Forceps.

Forceps are of three varieties, short, long, and axis traction, and of these there are endless patterns, but the author recommends Milne Murray's axis traction as being the best for all purposes demanding extraction of the foetal head. They are made entirely of steel, nickel-plated, and consist of a right and left blade, which are passed separately one on each side of the foetal head, and then locked by a special joint where they cross. The fenestrated spoon-shaped blades grasp the head like two hands, extraction being performed by traction on the forceps handles, or by means of the handle of the traction rods in the case of axis traction forceps of the Milne Murray pattern.

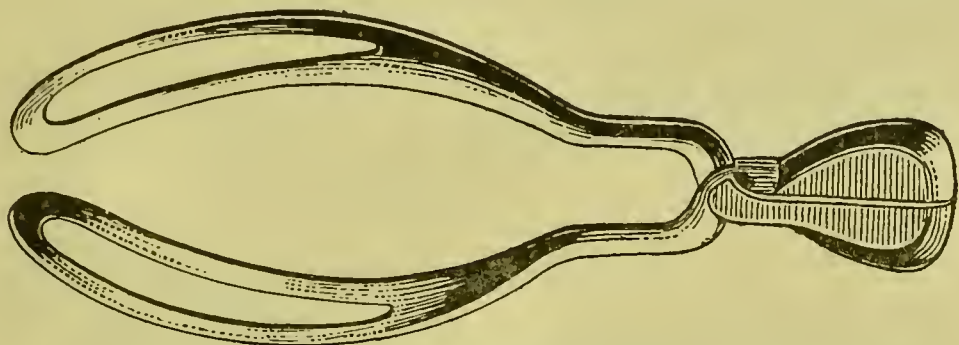


FIG. 121.—SHORT OR STRAIGHT FORCEPS.

1. **Short Forceps** (Fig. 121).—So called because (*a*) there is a cranial curve only adapted to fit the foetal head; (*b*) the long axis is a straight line; and (*c*) both blades are similar, so there is no particular right or left blade, and either can be passed first to the left side of the pelvis. Short forceps can only be used when the head is low down in the vagina (the *low operation*) and the blades can only be applied to the sides of the foetal head.

*Structure*.—Fenestrated blades with a cranial curve only, a Smellie lock, and a handle. If they are made long, shanks are added.

2. **Long Forceps**.—These are characterized not by their length, but by the addition of a *pelvic curve* to correspond to the pelvic axis, and permit of application when the head is high in the pelvis.

*Structure* (Fig. 122).—Fenestrated blades with cranial and pelvic curves, shanks, Smellie lock, shoulder and handles. The



distance between the points of the blades is one inch, and at the widest part three inches. Owing to the pelvic curve there is a *right* and a *left* blade. The *left blade has the point of the pelvic curve and the lock on the same side*, so at a glance the left

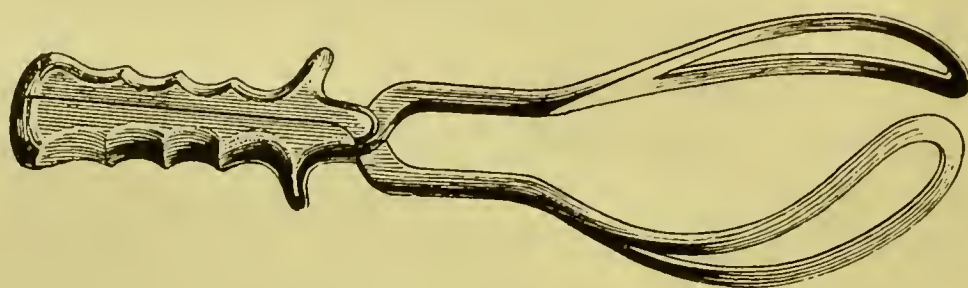


FIG. 122.—SIMPSON'S LONG FORCEPS.

blade can be distinguished from the right. The *left* blade is passed *first* to the *left* side of the pelvis, so the rule for the introduction of the forceps, with the patient lying on her left side, is *left lower first*.

3. **Axis Traction Forceps** (Fig. 123).—These are long forceps of special construction to admit of traction in the pelvic axis.

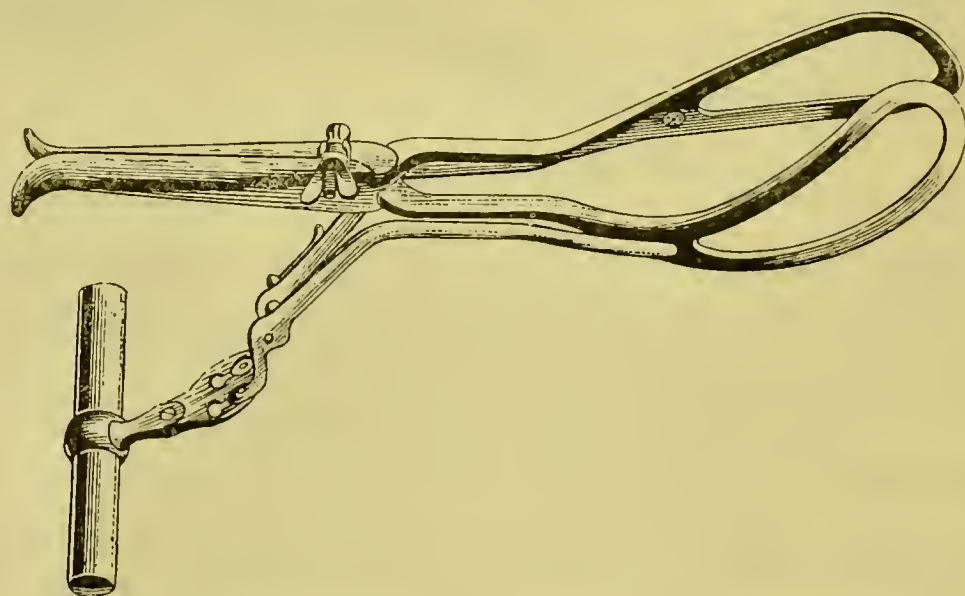


FIG. 123.—MILNE MURRAY'S AXIS-TRACTION FORCEPS.

There are various patterns, but Milne Murray's is the best. They have traction rods attached to the blades, and extraction is carried out entirely by the traction rods. For the principles of construction the reader is referred to the larger text-books.

**Indications** during second stage of labour.

I. *Faults in the Powers*.—(a) Primary inertia uteri, if the second stage is becoming too prolonged, but with great care not to empty the uterus too quickly.

(b) Weak or irregular uterine pains.

(e) Misdirection of the pains, as in pendulous abdomen.

(d) Failure of the accessory powers from lung or cardiac disease, general weakness, abdominal tumours, etc.

II. *Faults in the Passages*.—(a) Deformed pelvis. Flat pelvis, with C.V. not below 3 inches, justo minor not below  $3\frac{1}{2}$  inches.

(b) Rigid vagina, but exercising great care during extraction.

(e) Too prolonged crushing of the soft parts during a delayed second stage shown by increased pulse rate, slight rise of temperature, increased pain in the passages, and a hot dry condition of the vagina.

III. *Faults in the Passenger*.—(a) Large or unduly ossified head.

(b) Arrested brow or face case if too late to turn.

(e) Malrotated occipito-posterior case.

(d) After-coming head, if hand-grip fail.

IV. *Complex Labours*.—A. *Maternal* (a) Eclampsia.

(b) Partial placenta praevia.

(e) Accidental haemorrhage.

(d) Certain cases of ruptured uterus.

(e) Cardiac disease, as bearing down must be prevented.

B. *Foetal*.—(a) Prolapse of cord.

(b) Impacted twins.

(c) Threatened asphyxia, as indicated by the slowing of the heart beat, and escape of meconium in a head presentation.

**Positions of Patient**.—1. *Left Lateral Position*.—This is the usual position in this country for the majority of cases. The patient lies on her left side, with the body obliquely inclined into the bed, with the thighs flexed, and with the nates projecting slightly over the edge. The right thigh is held up by the nurse, to keep it out of the way during the introduction of the forceps. One can, however, pass the blades without assistance, if the patient's thighs are well flexed.

2. *Dorsal Position*.—The patient lies on her back in the cross-bed position, the thighs being supported by an assistant.

3. *Walcher's Hanging-leg Position* (Fig. 124).—The patient lies flat on her back in the cross-bed position, or better, on a table if the bed is too low, with the sacrum resting on the edge. If placed on a table, protect the nates from its sharp edge by a flat pillow.



After the forceps have been introduced, the lower limbs are allowed to hang down by their own weight clear of the floor.

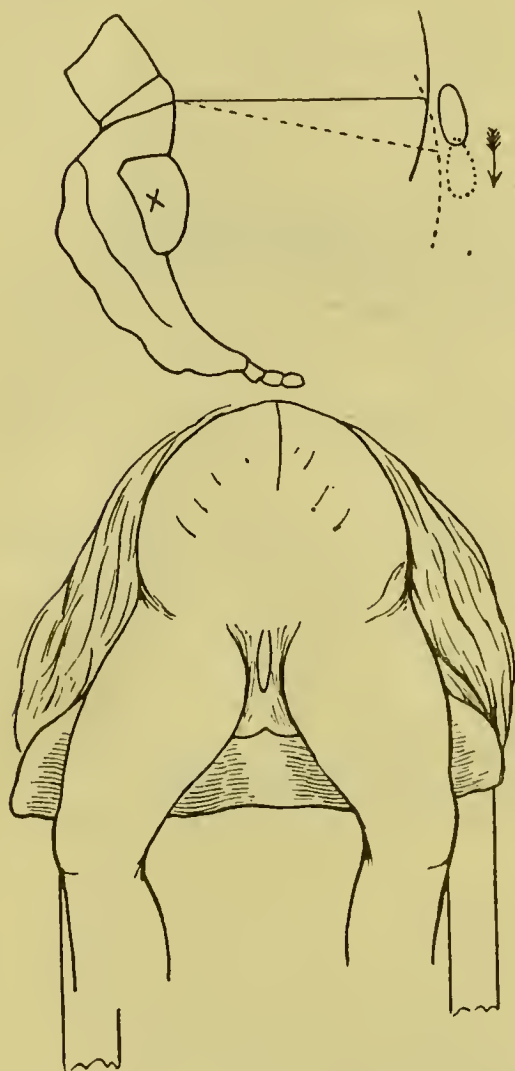


FIG. 124.—WALCHER'S HANGING-LEG POSITION.

The Conjugate at the Brim becomes increased by rotation taking place at X in the Sacro-iliac joints. The dotted line shows the increase in the length of the C.V. which averages  $\frac{1}{3}$  inch. This position is especially valuable for flat pelvises.

This causes the pelvis to rotate on the sacrum at the sacro-iliac joints, the sacral promontory being thus thrown back, while the end of the sacrum is tilted forward.

This movement increases the conjugata vera of the brim by as much as  $\frac{3}{8}$  inch in some cases (average  $\frac{1}{3}$  inch), which is especially valuable for flat pelvis. After the head has passed the pelvic brim, the patient's lower limbs must be raised to widen the pelvic outlet again. When the head is escaping from the vulva the legs may be again lowered, which helps to prevent rupture of the perineum.

**Nature of Operation**—1. *High Operation*.—If the forceps are applied when the foetal head is high in the pelvis or at the brim, it is called a high forceps case or a high operation. Only long forceps having a pelvic curve can be used, and the

blades pass through the cervix into the uterus. The cervix must be fully dilated in a primipara, and nearly so in a multipara, before the long forceps are used in the high operation.

2. *Low Operation*.—When the forceps are applied with the head low down in the vagina it is called a low-forceps case or a low operation. The blades lie in the vagina, so any variety of forceps may be used.

*Hand to be used for Introducing Blades*.—In the dorsal position the left blade, which is passed first, must be introduced with the left hand; the right blade with the right hand, while the opposite hand is used to guide the blade in the vagina.

In the lateral position both blades can be introduced with equal facility by the right hand, the left being used as the guide.

If preferred, however, the left blade can be passed with the left hand and the right blade with the right hand.

### Rules for Introduction of Forceps.

I. *Short Forceps*.—As both blades are exactly the same, either may be taken to be passed first and to the left side of the pelvis. The blades must only be applied to the sides of the foetal head, so-called *cephalic application*; therefore short forceps can only be used when the head is in the vagina and for the *low operation*.

II. *Long Forceps or Axis-traction Forceps*.—As the blades are different, owing to the pelvic curve, the left blade can only be passed to the left side, and the right blade to the right side, in the transverse of the pelvis, no regard being paid to the grasp taken of the child's head, whether it be a high or a low operation. This is called the *pelvic application* of the forceps. The cervix must be fully dilated and the membranes ruptured.

**Rules for Introduction of the Blades in the Left Lateral Position.**—The following description applies to a patient lying on her side. If she is lying on her back, the left blade must be passed with the left hand, and such expressions as "below the head and palm uppermost" would read "to the side of the head and palm turned inwards."

1. Pass the left blade first, and to the left side in the transverse of the pelvis. The rule is "left lower first," and this is stamped on the handle of the left blade of Milne Murray's axis-traction forceps.

2. Pass the fingers of the left hand into the vagina, and in high operations through the cervix, till they touch the foetal head and lie below it palm uppermost, so that the palmar aspects of the finger tips lie against the foetal head to guide the blade.

3. Hold the handle of the left blade lightly in the right hand and insert the point into the vagina, so that the blade lies flat on the fingers, and is directed in the axis of the vagina.

Commence the introduction just after a pain has passed off, so that there may be ample time during the interval to have



both blades adjusted before the next pain comes on. Should a pain come on, wait till it is over, this rule applying to the introduction of both blades.

4. Do not force, but insinuate the blade up towards the head, guiding it by the vaginal fingers, and when the point reaches the head, keep it in contact with the head by the vaginal fingers and pass it on in the pelvic axis. At first, when the point is inserted into the vagina in the vaginal axis, the handle lies well forward towards the right and upper thigh, but as the blade advances along the pelvic axis and round the head the handle is carried back towards the perineum and down towards the left hip.

5. When the left blade has been fully introduced, hold it steady with the right hand until the left hand is turned in the vagina to lie in the right side of the pelvis, with the palm turned downwards, with the tips of the fingers above the head. The left blade can now be steadied by the little finger of the left hand, while the right blade is being introduced.

6. Now introduce the right blade, which goes uppermost to the right side of the pelvis, with the same precautions and same action as for the left blade. The handle, which at first is well forwards towards the left and lower thigh, is carried back towards the perineum and up towards the right hip till it comes in apposition with the other handle.

Another good and equally suitable method for passing the right blade is to introduce it in the conjugate, and while advancing along the hollow of the sacrum the blade is rotated to the right side by a gradual turning movement of the handle.

7. When the right blade has been introduced withdraw the left hand to hold the handle of the left blade, and with both hands carefully adjust and lock the forceps. For this to succeed, the handles must be exactly opposite and parallel to one another; the slightest deviation prevents locking.

If there is any difficulty in locking, try the manoeuvre of forcing the handles well against the perineum. If this fail, one or both blades are not lying properly. No force must be used to try and adjust the handles, so if gentle manipulation fails withdraw the right, and, if necessary, both blades, and re-introduce them.

8. When the forceps have been locked, make a careful examination to see that they are properly applied to the head, and that no maternal tissues are caught in the blades or lock.

**Management of Traction Rods in Milne Murray's Forceps.**—The traction rod of the right blade is so made that it can be swung forward, and this must be done before the right blade is introduced, so as not to interfere with the lock being adjusted. After the forceps are locked, the right rod is swung back, adjusted to the left, and locked, and the traction handle fixed on. The fixation screw is finally put in place, but not tightened.

#### **Rules for Extraction.**

1. Traction only is to be done by a steady pull, beginning gradually, increasing in strength to the maximum, and then slackening off towards the end. On no account employ either a levering or swinging action.

2. Each traction lasts one minute, and should be done during the pains, but if the pains are at too long intervals, further traction is done at intervals.

The strength required is to be exerted entirely by the arms, and not by the weight of the body, or by the aid of a foot placed against the bed.

3. With the long forceps pull in the pelvic axis as well as can be judged. This is approximately indicated by the direction in which the handles point at the end of the previous pull.

With axis-traction forceps this is easy, as all that requires to be done is to keep the rods parallel with the shanks of the forceps, the handles of which act as an indicator.

4. After each pull note the progress of the head.

With axis-traction forceps the progress can be noted during traction, as only the right hand is required for pulling, leaving the left hand free, so that the fingers can be placed against the head in the vagina. The fixation screw is just sufficiently tightened to fix it during traction, and as soon as the pull is over, it is loosened, only to be tightened again just before the next traction.

5. When the head is at the outlet, support the perineum, and, if there is danger of rupture, straighten both lower limbs, and extend them well backwards. Thoroughly control the escape of the head, guiding it gently over the perineum by very



slight traction, or merely by a forward movement of the handles towards the mother's abdomen.

If axis-traction forceps are used, the head may be guided out by pulling on the traction handle with the left hand, while the right controls the advance of the head as in normal labour.

Delivery of the head must be completed by the forceps, and they are not to be removed till the head is completely born.

6. As the patient is usually anaesthetized, she should now be turned on her back, and the shoulders delivered by expression.

*Forceps in Occipito-posterior Positions.*—If the forceps have been applied to the head when in an occipito-posterior position, the long rotation of the occiput forward will cause the forceps to lie in the oblique or conjugate instead of the transverse. When this occurs they should be removed and re-introduced in the transverse.

*Galabin's or Pajot's Manoeuvre.*—This is done with the long forceps to simulate axis traction. While the right hand is exerting traction by the handles, the left hand grasps the shanks and pulls them towards the perineum.

*Forceps in Persistent or Malrotated Occipito-posterior Cases.*—The blades are adjusted by cephalic application to the sides of the head. During extraction the head is pulled down till the anterior fontanelle appears at the vulva, when the occiput is guided over the perineum. After the occiput is born, the handles are directed backwards in order to bring the forehead and face out under the pubic arch.

No attempt should be made to correct an occiput posterior by twisting the head round with the forceps.

*Forceps in Face Presentation.*—Forceps should not be applied, unless absolutely indicated, until the chin has rotated to the front, when the blades should be so adapted as to grasp the sides of the head by cephalic application.

After the chin is born guide the forehead, vertex, and occiput over the perineum.

Persistent mento-posterior cases must be perforated, as delivery by forceps is impossible with a full-time child.

*Forceps to the After-coming Head.*—Carry the child's body well forward towards its own dorsal aspect, and apply the blades to the sides of the head from the ventral aspect of the

child, so as to grip the front of the head, and bring the chin down and guide it over the perineum.

*After-coming Head malrotated with Face to the Front.*—Carry the child's body backwards towards its own dorsal aspect, and apply the forceps from the front to grasp the sides of the head.

Bring the chin out under the pubic arch, and when the face is born as far as the root of the nose, bring the occiput over the perineum.

*After-coming Head malrotated and extended.*—In the rare exception of the chin lying above the pubis, owing to great head extension of the malrotated head, carry the body forward, and apply the forceps from behind over the occiput. Deliver by bringing the occiput down and out over the perineum.

**Dangers of Forceps.**—Forceps should only be used when absolutely indicated. Their abuse, especially in primiparae, merely to quickly end the labour in order to gratify either the patient's desire for a speedy relief from her suffering, or the obstetrician's wish to get back to bed, is responsible for many injuries, ending in life-long trouble, and familiar to every gynaecologist.

The *maternal* risks are :

1. Lacerations of cervix, vagina or perineum, with tears into the anus.
2. Bruising of soft parts, with risk of after-sloughing and formation of fistulae.
3. Injury to pelvic joints, especially in deformed pelvis.
4. Emptying the uterus too rapidly, causing atony and post-partum haemorrhage.

The *foetal* risks are :

1. Bell's facial paralysis from pressure of the blade on the nerve.
2. Undue compression of or fracture of the skull.
3. Cephal-haematoma or intracranial haemorrhage from injury.
4. Scalp or face injuries; injury to the orbit or to the eye itself.

**Prognosis.**—This is most favourable in low operations; less favourable in high operations, malpresentations and malpositions of the head; and worst in deformed pelvis



### VIII. Version or Turning.

**Definition.**—Changing the presentation of the foetus by rotating it on its transverse or antero-posterior axis.

**Varieties.**—1. *Podalic Version.*—The breech is made to present from a head or transverse case and the foot pulled down. This is the usual method practised.

2. *Cephalic Version.*—The head is made to present from a transverse or breech case.

**Methods.**—These are : 1. External. 2. Bipolar. 3. Internal.

#### 1. Podalic Version.

**Indications.**—(a) *Maternal.* 1. Flat pelvis not below 3 ins., especially for a posterior parietal presentation.

2. Placenta praevia.

3. Accidental haemorrhage.

4. Where not having forceps you can turn to hasten delivery by extraction, or where it is the most rapid method of delivery in urgent cases such as eclampsia.

(b) *Foetal.*—1. Transverse presentation.

2. Brow or face case arrested at the pelvic brim.

3. Prolapse of the cord during the first stage.

4. Prolapse of limbs, as with complex presentations.

5. Monsters.

#### A. External Method.

**Definition.**—Both hands manipulate externally over the uterus (Fig. 125).

**Special indications.**—This method is rarely employed except to correct a transverse lie or convert a breech into a vertex presentation.

**Conditions necessary.**—It is easier done in a multipara than in a primipara, and the best time to try it is before labour sets in or early in the first stage of labour, as the membranes must be intact, and there must be sufficient liquor amnii to have the child freely movable.

**Preliminary.**—The bowel and bladder are emptied, and the patient lies in the dorsal position, with knees flexed and slightly abducted. Anaesthesia is not necessary.

**Method of Working.**—Raise the foetus above the brim, then lay the hands flat on the abdomen, one over the head, the other over the breech. Manipulate the foetus round by pushing the breech down and pulling the head up till the breech presents. If done during labour, turn between the pains; and should a pain come on, try and keep the foetus in the acquired position.

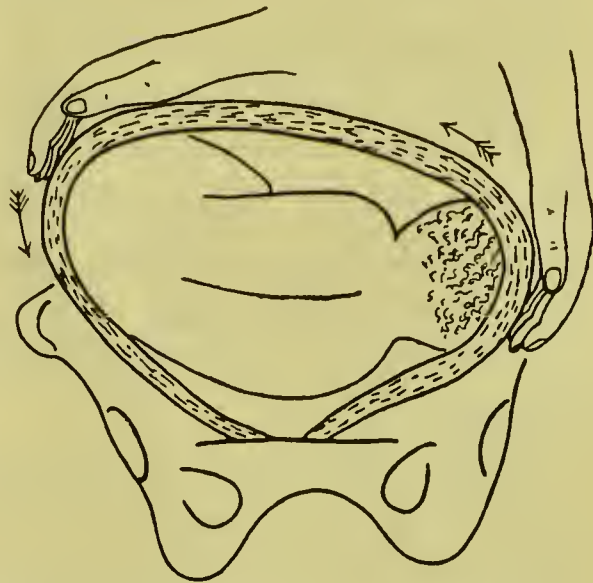


FIG. 125.—PODALIC VERSION BY THE EXTERNAL METHOD.

**Prognosis.**—Even if the version has been successful, the method is apt to fail, as the foetus tends to resume a faulty presentation. An attempt may, however, be made to prevent this by placing suitable pads at the sides of the uterus, and securing them by a tight binder to try and maintain the longitudinal lie of the foetus.

### B. Bipolar Method.

**Synonyms.**—Braxton Hicks' method. Internal digital method. Bimanual method. Combined external and internal method.

**Special Indications.**—The method is specially suitable for placenta praevia, transverse presentation and prolapse of the cord when the os is only slightly dilated.

**Definition.**—One hand works externally over the abdomen, while two fingers of the other hand work through the cervix to bimanually manipulate opposite poles of the foetus (Figs. 126, 127, 128).

**Conditions Necessary.**—The membranes must be intact or just recently ruptured, so that the uterus has not contracted on the foetus, and the os must be open enough to admit two fingers.

**Preliminaries.**—The bowel and bladder must be empty, the patient anaesthetized and placed in the dorsal position in the cross or oblique-bed position. The operator stands between the flexed thighs.

The position, as well as the presentation, must be accurately noted, as this determines the hand which is to be introduced into the vagina.



The left hand is introduced into the vagina if the foetal back in a head presentation, or the foetal head in a transverse presentation, lies to the mother's left side. The right hand is introduced if these parts lie to the right.

This rule may be remembered in another way. Introduce that hand into the vagina which happens to be opposite the side on which the foetal small parts lie as you face the patient's vulva. In head presentation, left occiput anterior, the foetal small parts are on the mother's right side, and opposite your left hand: therefore introduce the left hand into the vagina.

Disinfection must be scrupulously carried out as already detailed (p. 332), and the fore arms should be cleansed up to the elbows. Rubber gloves are an additional security.

**Method of Working.**—1. Pass two fingers through the os to reach the presenting part—the head in cephalic lie, the shoulder in transverse lie—and place the other hand over the breech (Fig. 126). Commence to turn just after a pain passes off.

2. Push the presenting part to one side by a movement of flexing the fingers, and if the correct hand is used this action of flexion indicates the proper direction in which to push. The other hand pushes the breech in the opposite direction.

Both hands work simultaneously, the object being to swing the foetus round by a series of short jerks in such a direction that the podalic extremity is bent towards the face, while the inner fingers keep pushing onward each new part as it comes down (Fig. 127).

3. Should a pain come on before the version is completed, all that can be done is to try and keep the foetus in the acquired position till the pain passes off and allows the process to be resumed.

4. Continue the manoeuvre till the knee comes down to the inner fingers (Fig. 128). The outer hand now presses firmly on the breech to force down the podalic extremity, while one of the inner fingers ruptures the membranes, seizes the nearer knee, and hooks it down to the os, ready to draw it into the vagina when the head has been pushed up.

5. As soon as the knee is seized, the outer hand is at once shifted over to the head, which is now pushed up into the fundus uteri before the leg is pulled down as far as it will come into the vagina. (Compare Fig. 102.)

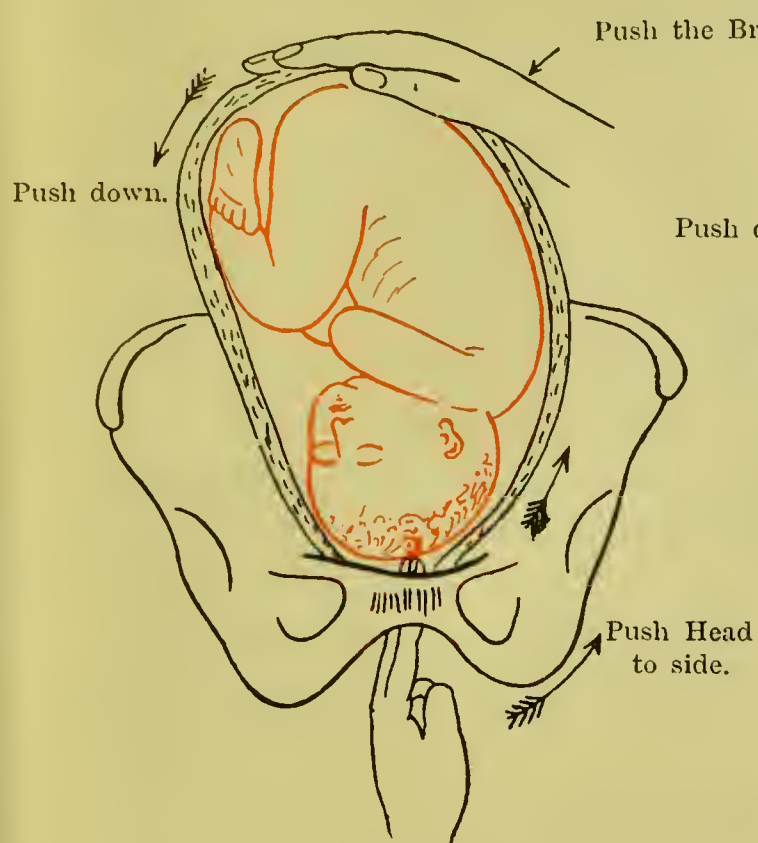


FIG. 126.

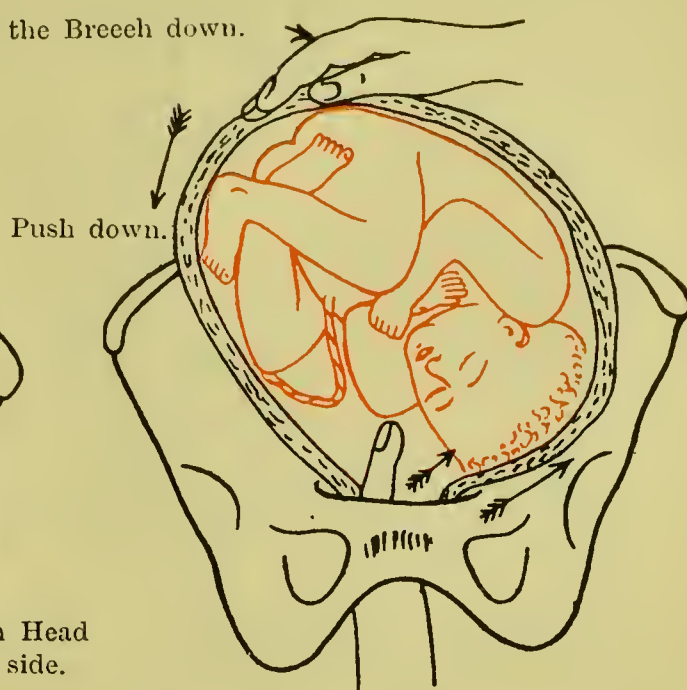


FIG. 127.

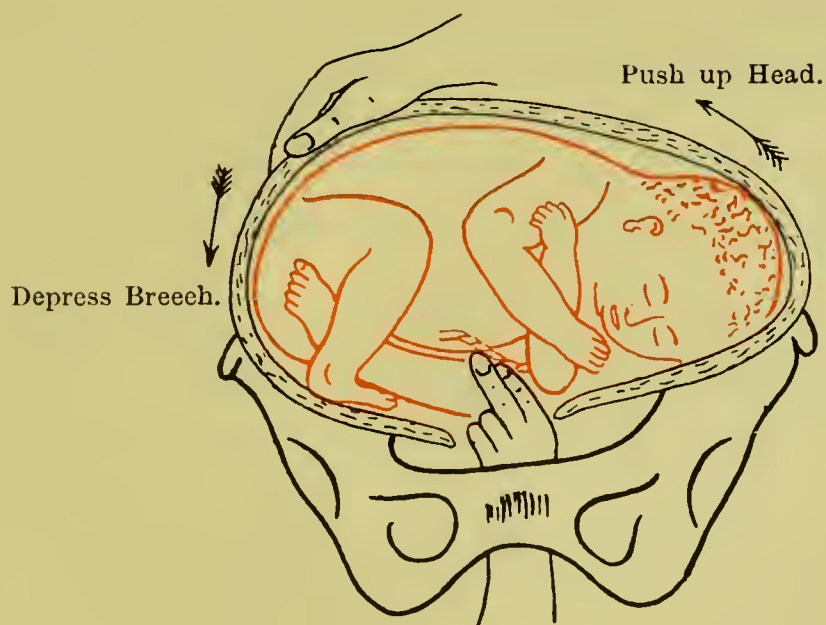


FIG. 128.

FIGS. 126-128.—PODALIC VERSION BY THE BIPOLAR METHOD.

The Foetus is turned by both hands working simultaneously in the direction indicated by the arrows.





**Further Management.**—If there is no urgency, as where version has been done for placenta praevia, the case is left to nature, and managed as in breech presentations.

If speedy delivery is demanded, this can only be done by extraction if the cervix is nearly fully dilated. (See "Extraction in Breech Cases.")

If version is done when the os is small, extraction cannot be speedily done, and if it is attempted the os will contract round the neck as soon as the trunk is past the cervix, causing a delay which is very grave for the child.

**Prognosis.**—The prognosis for the mother is usually good, as far as the version is concerned, and is safer than with internal version, to be described next.

The risks for the child are as in breech cases, with the added risk due to the complication for which version is performed.

### C. Internal Method.

**Synonyms.**—Internal manual method. Simpson's podalic version.

**Definition.**—One hand is passed into the uterine cavity, to seize a foot and pull it down, while the other hand is placed on the abdomen over the foetal breech.

**Special Indication.**—This is the only method which can be employed if the membranes have been ruptured for some time.

**Conditions Necessary.**—1. The os must be sufficiently widely dilated to admit the whole hand into the uterus, and if it is too narrow it must first be manually dilated before version can be attempted.

2. The presenting part must be movable enough to allow the hand to pass.

3. The pelvis if deformed must be sufficiently roomy to permit of the delivery of the child after turning—*e.g.* a flat pelvis must not be under 3 ins. C.V.

**Contra-indications.**—1. Retraction ring high up and great thinning of the lower uterine segment, or threatened rupture of the uterus. If an attempt is made to turn, the uterus will probably rupture, so version must on no account be done.

2. *Tonic Contraction of the Uterus.*—The liquor amnii has all escaped, the pains are strong and the uterus is retracted on the



foetus. No attempt at version must be made unless the uterus relaxes under treatment.

**Preliminaries.**—These are the same as detailed under “Bipolar Method” (p. 355).

If rubber gloves are worn, do not use a lubricant, as this makes them too slippery.

If the bare hand is used, only lubricate the back, to avoid making the fingers slippery.

Internal version may be done if desired, with the patient in the lateral position, though it is not so easy to manipulate the head externally, especially if there is any difficulty. In any case she should be put in the dorsal position if version is to be followed by extraction.

### Method of Working.

**I. Introducing the Hand.**—If the os is too small, it must first be manually dilated till the hand has room to pass, and if the membranes are intact avoid rupturing them during dilatation.

1. Open the labia with the fingers of one hand, and introduce the required hand cone-shaped directly into the vagina. Pass it onwards with a rotary movement along the vagina and through the cervix, displacing the presenting part towards that side on which the foetal back lies. The outer hand is placed over the fundus, but only steadies the uterus.

2. When the inner hand has passed the presenting part, place the outer hand on the abdomen over the foetal breech, and press it down so as to bring the foot as near the inner hand as possible.

3. Advance the inner hand along the ventral aspect of the foetus (with head presentation) until the required foot or knee is reached and seized, and if force is required press on the foetus and not on the uterus. If the membranes are intact, rupture them, and push in the hand at once to prevent the liquor amnii escaping.

4. Begin the operation just after a pain has passed off, so as to give plenty of time for the version to be completed during the interval. Should a pain come on when the hand is in the uterus lay the whole hand flat on the foetus, as if the knuckles are bent the hand will be cramped, and there is danger to the uterus.







FIG. 129.—HEAD PRESENTATION.

SIMPSON'S PODALIC VERSION BY THE INTERNAL MANUAL METHOD. GRASPING THE ANTERIOR KNEE TO PULL IT DOWN.

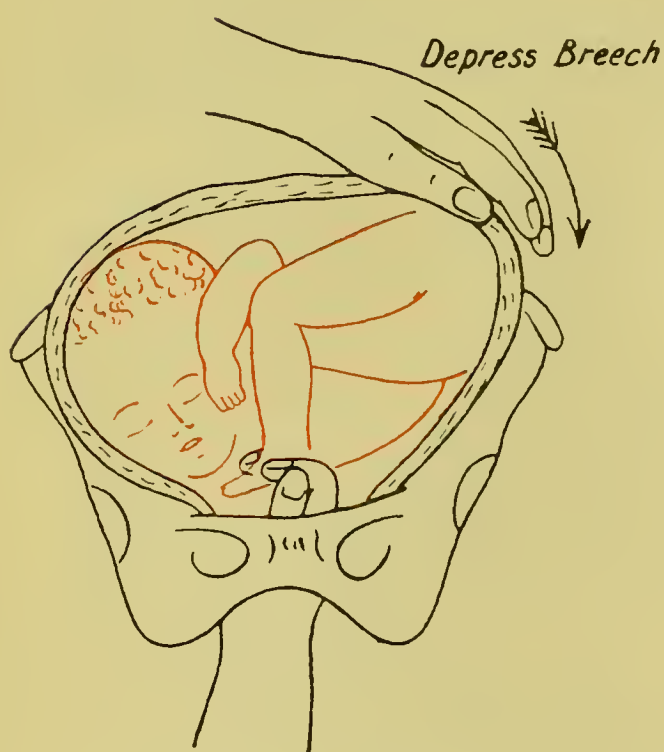


FIG. 130.

FIGS. 130-131.—SHOULDER PRESENTATION ;  
DORSO-POSTERIOR.

PODALIC VERSION BY THE INTERNAL MANUAL METHOD. GRASPING THE FURTHER FOOT AND PULLING IT INTO THE VAGINA.

In Dorso-anterior positions pull down the nearer and lower foot.

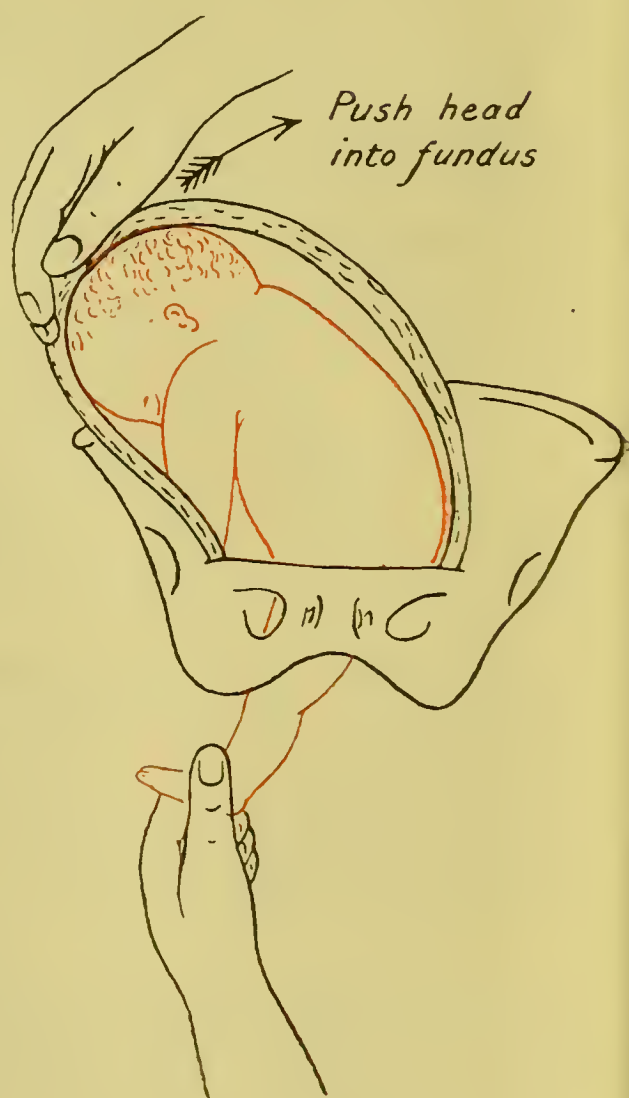


FIG. 131.

**II. Changing the Presentation.**—(a) *Head Presentation* (Fig. 129).—1. The leg to be selected is that one lying *anteriorly*—viz. the right leg in L.O.A. or L.O.P., the left leg in R.O.A. or R.O.P.; but in difficult cases one is content to seize either foot or leg.

2. While the outer hand presses down the breech to bring the lower limbs within easier reach, the inner hand seizes the foot or knee of the *anterior* leg between the fingers and pulls it down in front of the foetus. If there is any difficulty, try traction with a wavy motion.

3. As soon as the leg is seized, shift the outer hand to the head and push it up into the fundus uteri while the inner hand is drawing down the leg. If the leg is pulled down without pushing up the head, the foetus is doubled up and cannot turn.

4. If the head sticks in the lower uterine segment, or cannot be pushed up from the outside, as may happen when all the liquor amnii has been drained away for some time, and the foetal mobility is slight, bring down the other foot, the leg already pulled down being meanwhile fixed by the fingers or a bandage round the ankles. Only rarely will this procedure fail in enabling the head to be now pushed up from the outside.

A *second method* for overcoming this difficulty is to push the head up from the inside with the hand introduced into the uterus, while the foot already brought down is fixed by the fingers of the other hand or a bandage. This second method is, however, not free from danger, especially if the lower uterine segment is stretched, and should not be resorted to until the first method of bringing down the second foot has been tried, and again the attempt to push up the head from the outside has failed.

(b) *Shoulder Presentation* (Fig. 130).—1. The leg to be selected for bringing down in *dorso-anterior* positions is the *lower* and *nearer* one; in *dorso-posterior* positions the *upper* and *further* one.

2. Introduce the inner hand through the cervix till it strikes the shoulder and pushes it aside. In *dorso-anterior* positions, move the inner fingers along the foetus to the lower lying hip and then along the lower lying thigh and leg to seize the *lower* and *nearer* foot.



In *dorso-posterior* positions move the fingers along the ventral aspect of the foetus to reach the *upper* lying and further foot (Fig. 130). While the required foot is being sought for the outer hand presses down the breech to bring the lower limbs within easier reach.

3. As soon as the foot is seized, shift the outer hand to the other side of the abdomen and push the head into the fundus uteri (Fig. 131) while the foot is being pulled down into the vagina.

4. Should the legs be so *crossed* as to cause difficulty in the bringing down of one foot, pull *both* down.

(c) *Arm Presentation, the Arm lying prolapsed in the Vagina.*—The procedure for version is the same, and the prolapsed arm may be left alone, as, should it return into the uterus, it can easily be brought down later.

If, however, it is specially desired to prevent the arm returning, it can be kept down by holding on to a bandage hitched round the wrist.

**Further Management.**—After the foot and leg have been pulled into the vagina, an examination should be made to make sure that the leg lies anteriorly. If not, then the other leg must be brought down to prevent the risk of a malrotation of the trunk, and consequently of the after-coming head. The foetal heart should also be auscultated as an indication whether to leave the birth to nature or extract in the interests of the child should there be signs of asphyxia from compression of the cord, partial separation of the placenta or other cause.

**Prognosis.**—*Mother.*—This method is more unfavourable than bipolar version.

1. There is an increased risk of sepsis since the hand is introduced into the uterus.

2. The introduction of the whole hand into the vagina and through the cervix, and the pressure of the arm, lying in the vagina, on the soft parts during the manipulations are very apt to cause tears of the cervix, vagina and perineum, especially in primiparous women.

3. If too much force is used in a difficult case or the lower uterine segment is over-stretched, the uterus may be ruptured.

**Prognosis.**—*Child.*—The risks are as in breech cases.

## 2. Cephalic Version.

Podalic version is practically always preferred to cephalic version during labour, so the methods of performing the latter will only receive a short description.

**Indications.**—Breech presentation or transverse lie.

### (a) *External Method.*

1. *End of Pregnancy.*—If seen in the last week of pregnancy, endeavour to convert a transverse or breech into a vertex presentation by the *external method*. For the method see p. 355 and Fig. 125, but in manipulating the foetus round the head is brought down. If the foetus tend to return to its original lie, try and retain it in the proper position by suitable pads at the sides of the uterus, held in place by a binder.

2. *During First Stage of Labour.*—The cephalic version may be tried by the *external method* as above, if the following conditions are present:

**Conditions Necessary (a)**—The membranes must be intact.

(b) There must be sufficient liquor amnii to let the foetus be easily turned.

(c) The presenting part must not be engaged in the brim.

(d) The abdominal wall must not be too thick, as much fat makes the procedure difficult or impossible.

(e) The uterine contractions must not be too frequent nor too strong.

If the external method fail, then:

(a) In a *breech presentation* leave the case to nature and manage as usual.

(b) In a *transverse case*, if cephalic version is desired, and the necessary conditions are present, one of the combined methods may be tried as follows:

### (b) *Cephalic Version by Combined Methods in Transverse Lie.*

**Conditions.**—1. The membranes must be intact or only recently ruptured, so that the foetus is rather freely movable. If the liquor amnii be drained off and the uterus contracted on the foetus, podalic version must be done.

2. The labour pains must be good; if they are weak, perform podalic version.

3. With a flat pelvis perform podalic version.



**Methods.**—1. *Braxton Hicks*'.—The patient lies in the dorsal position, and the os must be open enough to admit two fingers. Two fingers introduced through the cervix, push the shoulder

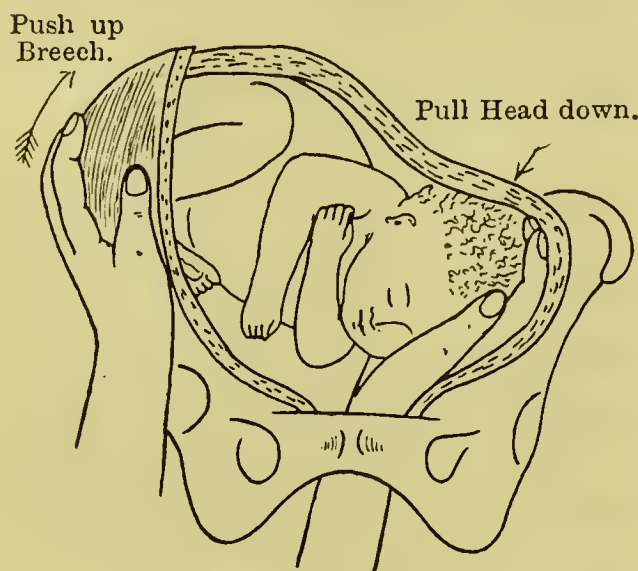


FIG. 132.—BUSCH'S METHOD OF CEPHALIC VERSION FOR A SHOULDER PRESENTATION.

The inner hand pulls down the Head, while the outer hand pushes the Breech into the Fundus.

in the direction of the feet, while the outer hand over the uterus presses the head into the brim. This will bring the head close to the os, when it can be received on the inner fingers and placed in a proper position. If the breech will not rise to the fundus readily and the head is fairly over the os, withdraw the vaginal hand and with it press up the breech externally.

2. *Busch's* (Fig.132).—The patient lies in the dorsal position, and the os must

be sufficiently dilated to admit the hand. Introduce the *right* hand if the head lies to the *left*, and *vice versa*. The inner hand ruptures the membranes, seizes the head, and pulls it down over the os, while the outer hand pushes up the breech.

3. *D'Outrepont's* (Fig. 133).—The patient lies in the dorsal position, and the os must be sufficiently dilated to admit the hand. Introduce the *left* hand if the head lies to the *left*, and *vice versa*. The inner hand seizes the

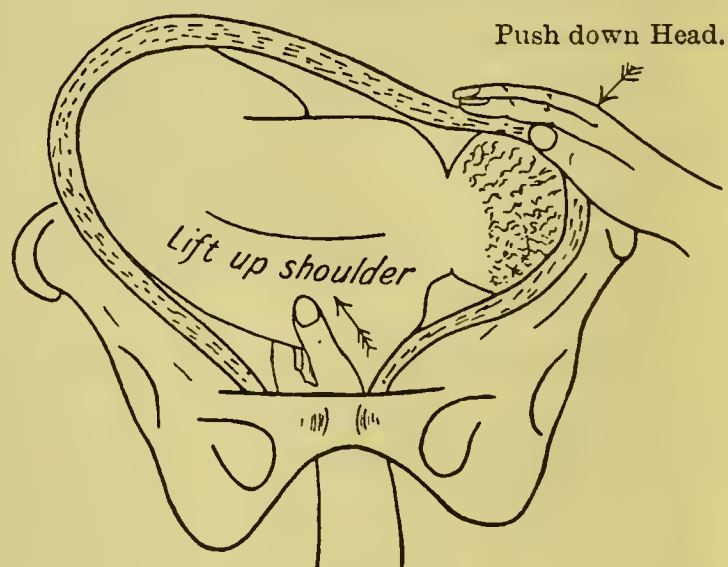


FIG. 133.—D'OUTREPONT'S METHOD OF CEPHALIC VERSION FOR A SHOULDER PRESENTATION.

The inner hand pushes the Shoulder towards the Breech, while the outer hand pushes the Head into the Pelvis.

shoulder between the finger and thumb, lifts it and pushes it over in the direction of the breech, while the outer hand pushes the head down into the pelvis.

## IX. Extraction in Breech Cases or after Podalic Version.

There are three operations necessary in extraction :

1. Delivery of the breech and trunk.
2. Bringing down the extended arms.
3. Extraction of the after-coming head.

**Indications.**—*Mother.*—Any condition demanding speedy delivery either in breech cases or after podalic version.

*Foetus.*—(a) Threatened asphyxia, as from compression of the cord, partial separation of the placenta or other cause.

(b) Impaction of the breech owing to a narrow pelvis, rigid passages or large foetus.

**Conditions Necessary.**—(a) The *cervix* must be nearly if not *fully dilated* in a *primipara*, and *at least half dilated* in a *multi-para*, especially if extraction has to be done in the child's interest.

If the *cervix* is not fully enough dilated there is great difficulty in bringing down the arms, which extend above the head, as the result of effecting delivery by traction on the legs.

If the *cervix* is not sufficiently dilated to let the head come down, but is merely stretched by the trunk, it contracts round the neck, leading to serious delay at the most important stage in the delivery, and causes the death of the child ; and should violent attempts be made to get the head through, it may cause very serious laceration of the *cervix* without saving the child.

(b) The membranes must have ruptured.

(c) The pelvis if deformed must be large enough to permit delivery before extraction is attempted.

**Preliminaries.**—The patient is anaesthetized and placed on her back in the cross-bed position after the bowel and bladder are emptied. Antiseptic precautions are strictly attended to, as detailed on p. 332. Towels should be at hand to wrap round the slippery body and preparations made for resuscitating the child, as detailed in the management of breech cases.

### 1. Extraction by Feet or Breech.

(a) *Breech Movable above the Brim.*

If podalic version has been performed, the leg is already down ; in movable breech cases the *anterior* foot must be brought down.



**Method of bringing down the Anterior Foot.**—1. Introduce the *left* hand into the vagina if the foetal back lies on the *left* side ; the right hand if the foetal back is to the right side.

2. Slip the fore and middle fingers over the *anterior* hip and along the thigh, knee and leg to reach the *anterior* foot.

3. Seize the foot and pull it down into the vagina, and commence extraction by the leg.

4. If the posterior foot is brought down by mistake, leave it alone, re-introduce the hand, bring down the other foot and extract by both legs.

**Method of Extraction.**—1. Grasp the limb in such a manner that the thumb is extended along the posterior aspect, while the rest of the fingers surround the leg and exert steady traction. Use the left hand for the left leg and the right hand for the right leg. If the limb is slippery, wrap a piece of gauze or fold of towel round it.

2. If both legs are down hold the left with the left hand and the right with the right hand, and pull on both.

3. As the limb is being gradually born, pull successively on leg and thigh and breech, and as soon as the posterior hip appears, hook the forefinger of the other hand into the groin, the thumb being placed on the sacrum.

4. Never grasp the body higher than the breech, both thumbs being placed along the sacrum, while the fingers surround the pelvis.

5. By traction on the pelvis only, deliver the trunk as far as the angles of the scapula. At this stage it will usually be found that the arms have extended above the head and must now be brought down, followed by extraction of the head as described below.

If a skilled assistant is at hand, he should aid your extraction by expression from above, and this may in some cases prevent the arms extending above the head. Expression by an assistant is especially valuable during extraction of the head in a flat pelvis.

*(b) Breech fixed in Pelvis. Impacted Breech.*

The breech being fixed in the pelvis, traction must be made on the breech, as a leg cannot be brought down.

**Method.**—1. Insert the *left hand* into the vagina if the *left hip* lies to the front as in L.S.A., the right hand if the right hip is anterior as in R.S.A.

2. Lay the thumb along the sacrum, and hook the forefinger into the fold of the *anterior* groin, and thus grasping the foetal pelvis between the forefinger and thumb, pull down the breech.

3. When the posterior hip comes within reach, grasp it by the other hand in a similar manner.

4. Guide the anterior hip out under the pubic arch, and then bring the posterior hip over the perineum.

5. Delivery of the trunk, bringing down the extended arms and extraction of the head complete the delivery.

**Methods where Manual Extraction fails.**—The following methods are more dangerous than the hand grip, as the traction is mainly on the groin, and the soft parts may be cut or bruised or the femur fractured.

1. Slip a gauze bandage, handkerchief, strip of calico or similar suitable article (rendered sterile by boiling) over the anterior groin, or both if possible. Jellett's method is an excellent one. Take a piece of double gauze, 2 ins. wide and 18 ins. long, rolled up like a bandage. Hold the free end, and push the roll up between the anterior thigh and pelvis in such a manner that the bandage unrolls as it advances. As soon as it is high enough, push it inwards over the groin, and then pass the fingers up between the thighs and pull the gauze down.

2. Should this fail, slip a string over the groin by a curved gum elastic catheter passed up between the thighs and over the groin. Attach a bandage to the string, and pull it over the groin.

3. Forceps are rightly objected to, owing to their danger and unsatisfactory grip.

4. If the child is dead, instrumental extraction is done, if necessary for the mother's sake, (*a*) by a blunt hook fixed over the anterior groin; (*b*) by a cranioclast, the male blade being passed into the rectum and the other blade over the sacrum; or (*c*) by a cephalotribe, which crushes and grasps the foetal breech.

## 2. Bringing down the Extended Arms.

As already stated above, the arms usually extend above the head during extraction after podalic version or in breech cases. It rarely occurs in natural delivery of breech cases unless



interfered with, especially by traction. The arms should be brought down as soon as the trunk is born as far as the angles of the scapula, as the shoulders stick above this if the arms are extended.

**Preliminaries.**—The patient lies on her back in the cross or oblique-bed position, while the operator sits or stands between the patient's thighs.

A warm towel should be wrapped round the child's slippery body.

The foetal left arm is brought down with the operator's left hand, the right arm with the right hand.

**Method.**—1. Begin with the posterior arm. Seize the child by the legs or breech, and swing the trunk well forward toward the pubes of the mother, this movement bringing the posterior arm further down and within easier reach.

2. With the fore and mid fingers sweep over the posterior shoulder and along the upper arm till the bend of the elbow is reached.

3. Using gentle pressure, push the *elbow* down over the face and along the front of the chest. Do *not* catch the arm near the shoulder, as you may thus fracture the humerus.

4. Now change hands, and, seizing the legs or breech, swing the trunk backwards as far as possible to bring down the anterior shoulder.

5. Bring down the anterior arm by the same manoeuvre as the other.

Another method for delivering the anterior arm is to hold the child with the thumbs over the scapulae and the fingers round the thorax, and rotate the child till the undelivered shoulder is in the neighbourhood of the *nearer* sacro-sciatic notch. The legs and trunk are then carried forward, and the arm delivered as above.

In difficult cases where the arms are extended high up and are difficult to reach, or where they are misplaced, it may be necessary to pass the whole hand into the uterus to free the arms and bring them down in front of the face. In all cases avoid traction on the humerus, as it fractures very easily.

Always examine the child after delivery, especially if there has been any difficulty in bringing down the arms, to exclude a possible fracture of humerus or clavicle.





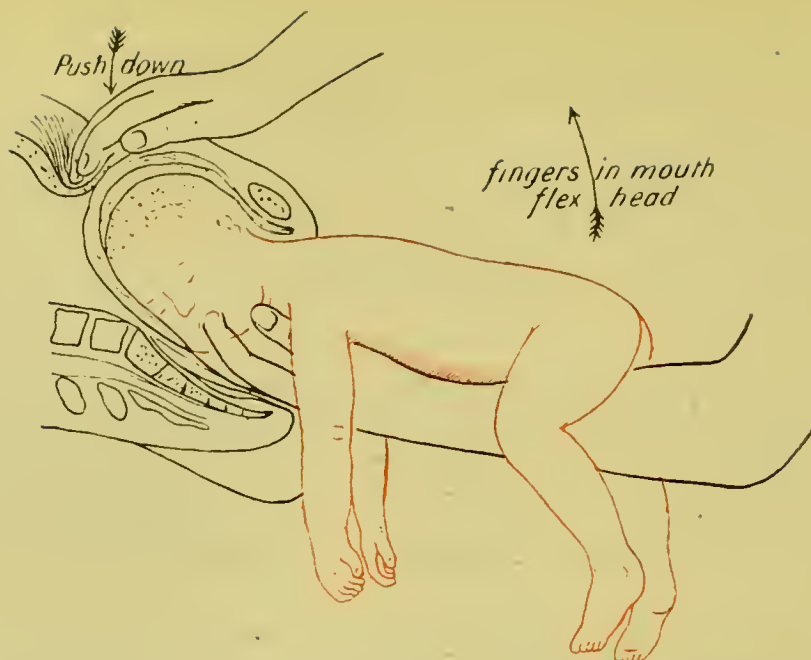


FIG. 134.—WIGAND-MARTIN OR WINCKEL'S METHOD.

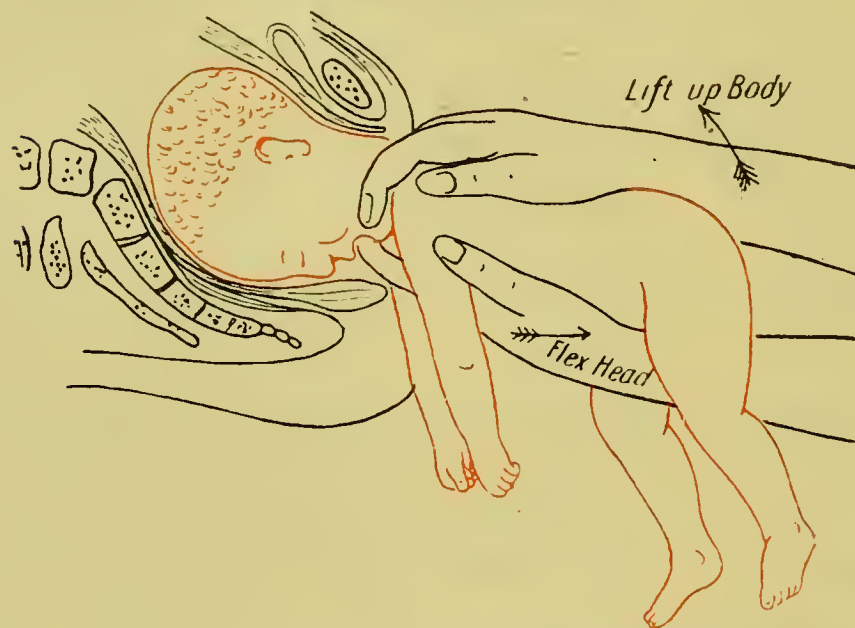


FIG. 135.—VEIT'S OR MAURICEAU'S METHOD.

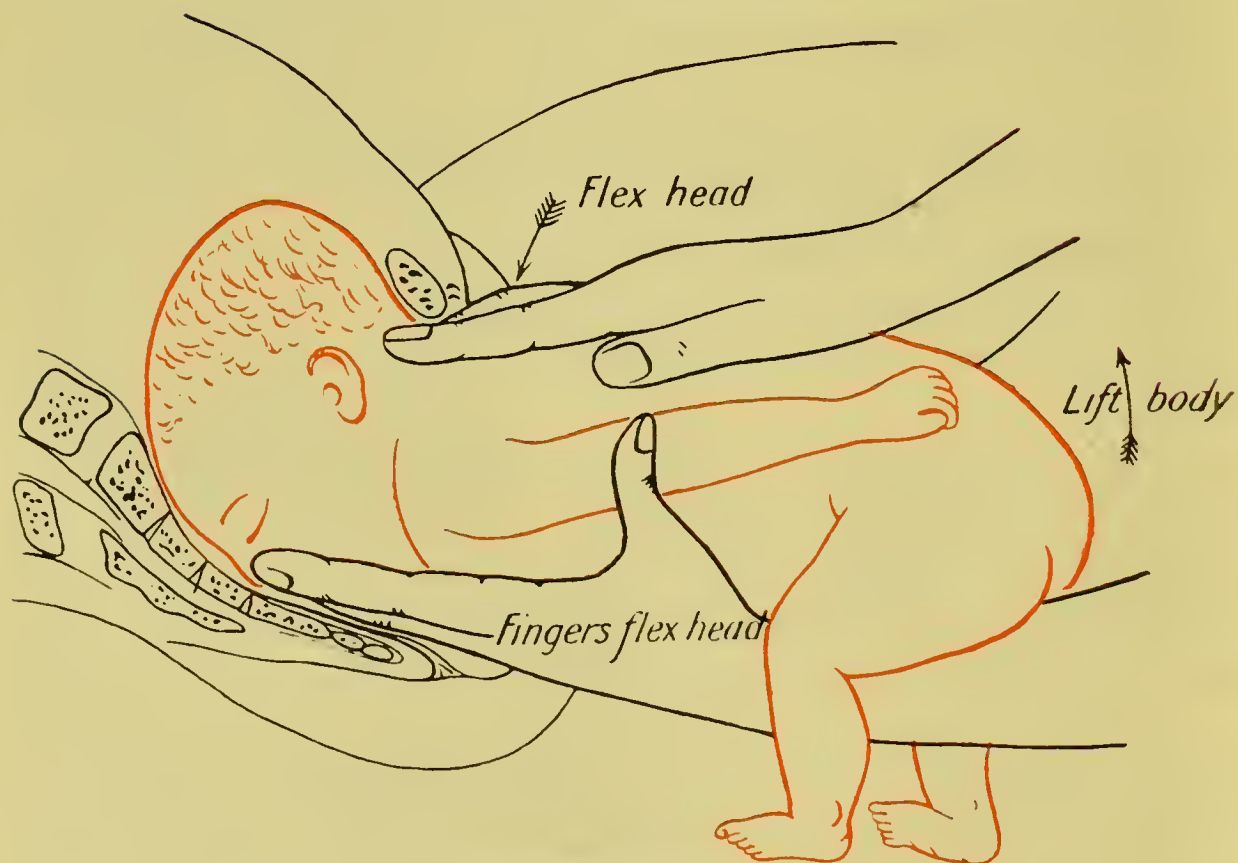


FIG. 136.—SMELLIE'S METHOD.

METHODS OF DELIVERING THE AFTER-COMING HEAD.

To face p. 367.

### 3. Extraction of After-coming Head.

**Indication.**—If after delivery of the trunk and shoulders the head is not promptly born, it must be extracted.

#### (a) *Manual Extraction.*

**Methods.**—I. *Winckel's Grip* (Fig. 134).—1. The fore and mid fingers of the left hand are inserted well back in the mouth along the alveolar edges, and the head kept flexed. The child lies on the forearm.

2. The right hand, on the fundus uteri, presses the head downwards and backwards.

3. When the head comes to the pelvic outlet, elevate the trunk by the forearm and pull on the chin by the fingers in the mouth to guide it over the perineum.

II. *Veit's or Mauriceau's Grip* (Fig. 135).—1. Two fingers of the left hand are placed in the mouth as above.

2. The fore and mid fingers of the right hand are hooked over both shoulders.

3. The other fingers of both hands surround the thorax, and the child lies on the left forearm.

4. The head is kept flexed and extracted, the body being carried well forward towards the mother's abdomen, and the chin guided over the perineum.

III. *Smellie's Grip* (Fig. 136).—1. The fore and mid fingers of the left hand are placed over the canine fossae, but beware of injuring the eyes. The child lies on the left forearm.

2. The fingers of the right hand are placed on the occiput.

3. Keep the head flexed and extract.

IV. *Smellie's and Veit's Grips* may be combined if the left fore and mid fingers are put in the mouth, while the fore and middle fingers of the right hand are laid on the occiput, and the third and little fingers are placed over the right shoulder. The remaining fingers of the left hand and the thumb of the right hold the thorax, the child lying along the left forearm as usual.

Both Smellie's and Veit's methods are greatly facilitated if a skilled assistant expresses from above by both hands placed on the fundus uteri, and this aid is especially valuable in deformed pelvis.

The Prague grip is too dangerous, and is never done now, so need not be described.



**Cases of Malrotated Head, with the Occiput in the Hollow of the Sacrum.**—Endeavour to manually rotate the occiput to the front, and deliver as above. If this fail, carry the foetal body well backwards and bring down the chin first from under the pubic arch by the hand grip or forceps, and when the face is born as far as the root of the nose bring the occiput over the perineum. In the rare exception of the chin hitching above the pubes, bring down the occiput first by forceps.

*(b) Forceps Extraction.*

Always have forceps ready for immediate use in case the manual methods fail. The method of forceps extraction has already been described under "Forceps" (p. 352).

## X. Craniotomy.

**Definition.**—This is a general term for operations performed in the interests of the mother, involving perforation of the foetal skull, and its comminution or reduction in size, followed by extraction through the natural passages.

**Indications.**—(a) *Maternal.*—1. Deformed pelvis; flat,  $2\frac{1}{4}$  to 3 ins.; justo minor,  $2\frac{1}{2}$  to  $3\frac{1}{2}$  ins. A deformed pelvis is the most frequent indication, and, as far as general practice is concerned, craniotomy still has its place, since pubiotomy and caesarean section should only be performed by the skilled surgeon. In any case, craniotomy is the operation of selection in cases likely to be septic by too frequent examinations or futile attempts at forceps delivery.

2. Minor degrees of deformed pelvis and the foetus dead. Perforation should be done to avoid a difficult forceps extraction.

3. Too prolonged crushing of the soft parts during the second stage, shown by a rise of temperature and pulse, or by the presence of blood in the urine. This may arise with a minor degree of justo-minor pelvis and large head, where, owing to the difficulty of determining whether a forceps delivery is possible or not, forceps have been applied, but careful traction has failed to move the head.

4. Obstruction from a tumour of the bony pelvis, or a fibroid of the lower uterine segment. This is only justified if

the obstruction is *not* too great to prevent delivery after perforation and cephalotripsy, the child being already dead, or, if alive, the services of a skilled surgeon are not obtainable in time.

5. Conditions demanding rapid delivery in the interests of the mother, such as eclampsia, especially if the child be dead. The cervix does not require to be so fully dilated if the head is reduced in size.

(b) *Foetal*.—1. Hydrocephalus or other foetal deformity obstructing labour.

2. Impacted malpresentation or malposition, such as brow presentation or malrotated face presentation.

**Conditions Necessary.**—1. The membranes must be already ruptured.

2. The cervix must be dilated to about 3 ins. in diameter at least, to allow of perforation and extraction.

3. The minimum diameter of a deformed pelvis must not be below  $2\frac{1}{4}$  ins. in a flat pelvis,  $2\frac{1}{2}$  ins. in a justo-minor pelvis and about fist size in obstruction from a bony tumour. If the diameter is less than this, craniotomy on a full-time foetus is so difficult and so dangerous to the mother that caesarean section is safer.

**Prognosis.**—This is generally good, provided the pelvic deformity is not so great as to make the operation one of great difficulty.

It is bad if the operation is done too late, if there have been improper, frequent or too forcible attempts at forceps delivery, the use of forceps being contra-indicated, and it is especially bad if aseptic and antiseptic precautions are not most thorough.

The *Dangers* are—1. Injury or even perforation of the uterus from the perforator slipping.

2. Severe laceration of soft parts from the sharp projecting edges of bone at the site of perforation. These sharp edges cut into the tissues during extraction, so they should be carefully looked for and removed by forceps.

3. Shock and haemorrhage.

4. Even with careful antiseptic precautions the risk of sepsis is increased owing to the amount of necessary manipulation, injury and bruising of soft parts.

**Stages of Operation and Instruments required.**—There are either two or three stages in the operation of craniotomy,



depending on the necessity or not of still further reducing the size of the head after perforation by crushing or comminution.

The instruments in most general use are the perforator (Fig. 137), the cranioclast (Fig. 139), the cephalotribe (Fig. 141), and a pair of forceps to remove projecting pieces of bone.

If preferred, the first three instruments may be combined in one in the form of Auvar's basiotribe or cephalo-cranioclast (Fig. 142).

The crotchet (Fig. 138) and craniotomy forceps are not necessary, but are described below, as they are still used by some operators.

The three stages are: 1. *Perforation*.—This must always be done first, whether the head requires crushing or not, and may be all that is necessary as a preliminary to extraction by forceps or the cranioclast in such conditions as hydrocephalus.

2. *Comminution* or further reduction in the size of the head.

If necessary, the head is further reduced in size after perforation by

(a) *Craniotomy Forceps*.—The cranial vault is reduced by breaking off and removing bits of bone round the margin of the perforation by special bone forceps. This operation is tedious, involves too much manipulation, and is not to be recommended.

(b) *Cranioclast*.—The cranial bones are torn from their basal attachments by cranioclasm.

(c) *Cephalotribe*.—These are special forceps, which crush the head—cephalotripsy.

(d) *Cephalo-cranioclast* or *Basiotribe*.—This crushes the head in the same manner as the cephalotribe.

3. *Extraction*.—This may be done by the crotchet or forceps, but preferably by the cranioclast, cephalotribe or basiotribe.

Version is dangerous, so should not be done.

### 1. Perforation.

Simpson's perforator (Fig. 137) is the best instrument.

**Preliminaries.**—Have a consultation if the child be alive. Place the patient in the dorsal position, and deeply anaesthetize. Empty the bowel and bladder. Carry out thorough antisepsis of hands, vulva, vagina and instruments, and have a pail for the brains.

**Operation.**—1. The membranes must be ruptured and the os about 3 ins. in diameter at least; if not, dilate.

2. Carefully note the cervix, sacral promontory and position of the head, so as to decide where to perforate.



FIG. 137.—SIMPSON'S PERFORATOR.

3. An assistant fixes the head by supra-pubic pressure if it is movable above the brim.

4. During introduction of the closed perforator guard and guide the point with the palmar surface of the fore and middle fingers.

5. Apply the point at right angles to the parietal bone, and carefully bore through the bone by a rotary motion. Some prefer to perforate through a suture or fontanelle.

6. Push in the perforator as far as the shoulder, unlock the handle, open the blades widely to full extent, then close the perforator and turn it half round on its axis and open the blades again.

7. Advance the point to break up the brain to its very base, including the medulla, to ensure that the child will show no signs of life after being extracted.

8. Douche out the brain from the skull.

*Face Cases.*—Perforate through the forehead, frontal suture orbit or mouth, whichever is easiest.

*After-coming Head.*—Perforate behind the ear or through the floor of the mouth and base of skull, selecting that portion of the skull lying nearest the symphysis pubis.

*Extraction.*—Extract after perforation by the cranioclast, but if the head must be further reduced go on to comminution.

In breech cases deliver by traction and hand grip; or by the cephalotribe if comminution is necessary.

## 2. Comminution.

It may be necessary to still further reduce the size of the foetal head after perforation, and this may be done by (1) craniotomy forceps, (2) cranioclasm, (3) cephalotripsy.



1. **Reduction by Craniotomy Forceps.**—These are small bone forceps, with blades shaped like a cranioclast for breaking down the cranial bones piecemeal. The outer blade is passed between the scalp and the bone. Bone only is seized, and the pieces are broken off bit by bit from the margins of the perforation, thus gradually diminishing the head. The operation is tedious, involves too much manipulation, and is not to be recommended being inferior to the other methods.

*Extraction.*—When the whole vault is removed, convert the vertex into a face presentation by pulling on the chin with the



FIG. 138.—BLUNT HOOK AND CROCHET.

crotchet (Fig. 138), blunt hook or hand. The head is then delivered by catching it under the chin with the crotchet. If it is necessary to further reduce the size of the head, apply the cephalotribe, crush and extract.

2. **Cranioclasm by Cranioclast.**—1. Use Braun's cranioclast (Fig. 139). Guided by the left hand in the vagina, pass the

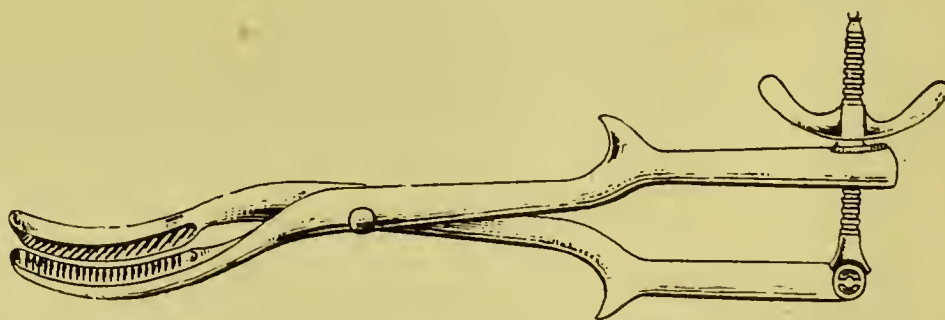


FIG. 139.—BRAUN'S CRANIOCLAST.

solid male blade through the perforation opening to the base of the skull.

2. Next pass the fenestrated female blade outside the skull (Fig. 140).

3. Apply the blades first to the occiput, screw up tightly, and by twisting the instrument from side to side fracture the bone and tear it from its basal attachments.

4. The sides and front are treated in like manner till all

the bones of the cranial vault are broken up and separated from the base of the skull.

*Extraction by Cranioclast without or after Comminution as above.*—1. Make the blades grip over the face (Fig. 140) if possible, as the instrument is less liable to slip.

2. See that no maternal tissues are caught, then screw the blades up as tightly as possible.

3. Extract as in forcep cases, and protect the passages from the risk of being lacerated by splinters of bone. Remove all projecting pieces of bone by forceps or fingers as they are felt during extraction.

### 3. Cephalotripsy by Cephalotribe.

—The instrument used is Hicks' cephalotribe (Fig. 141), a non-fenestrated solid pair of narrow-bladed, strong forceps. The points meet when the blades are closed, and the widest part between the blades is about  $1\frac{1}{2}$  ins. It is used to crush the whole head, and is also used for reducing the size of an impacted breech. The cephalotribe must never be used on the head without a preliminary perforation. The blades have a slight pelvic curve, and are



FIG. 140.—EXTRACTION BY BRAUN'S CRANIOCLAST AFTER PERFORATION.

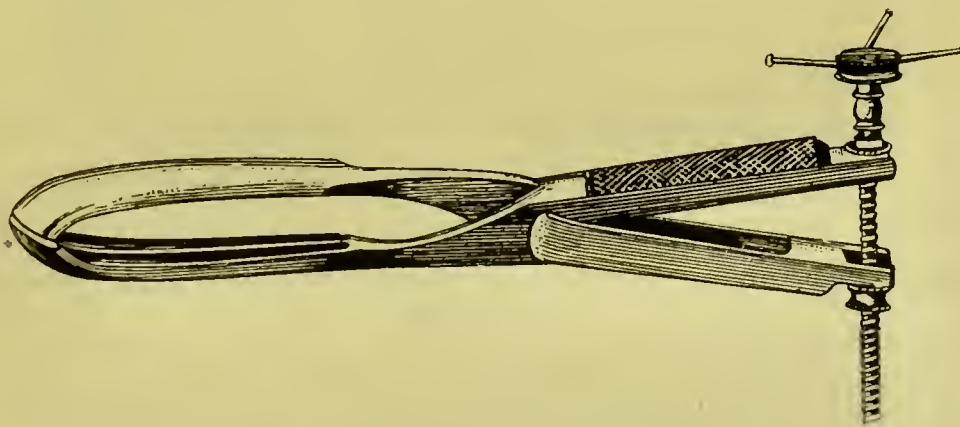


FIG. 141.—HICKS' CEPHALOTRIBE.

applied to the head in the same manner as with long forceps. They are first applied to the part of the head lying posteriorly,



and screwed up as tightly as possible by the screw fixed to the end of the handles. A fresh grip is then taken anteriorly, and the blades again screwed up tightly until the whole head is thoroughly crushed.

*Extraction* is done with the cephalotribe as with ordinary forceps.

4. **Basiotribe or Cephalo-cranioclast.**—Jardine has improved Auvard's instrument by lengthening it.

This instrument combines the perforator, cranioclast and cephalotribe (Fig. 142).

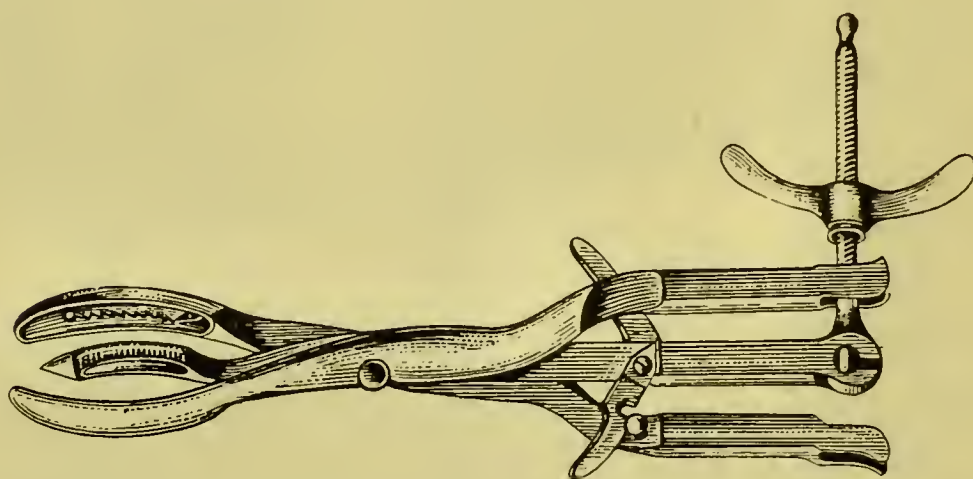


FIG. 142.—CEPHALO-CRANIOCLAST OR BASIOTRIBE.

The perforator is forced through the cranial vault down to the base of the skull. The blades are then applied externally one after the other, and preferably over the face and occiput respectively. The blades are screwed up tightly so as to thoroughly crush the head.

*Extraction* is now done with the instrument as with forceps.

### 3. Extraction.

The methods of extraction have already been described under the various instruments used for comminution.

*Extraction of the After-coming Head* is done by one of the hand grips described on p. 367, the use of the cranioclast being rarely necessary.

If comminution is required, the head is crushed and extracted by the cephalotribe.

## XI. Embryotomy.

**Definition.**—This is a general term for operations performed in the interest of the mother, involving the reduction in size of the child's body. These operations are:

1. Decapitation.
2. Evisceration and spondylotomy.
3. Cleidotomy.

**Indications.**—The operations are rarely necessary.

1. Impacted transverse presentation where version is impossible owing to undue thinning of an over-stretched lower uterine segment as in threatened rupture of the uterus.

2. Locked twins.

3. Monsters.

**Conditions Necessary.**—1. The membranes must be ruptured.

2. The cervix must be sufficiently dilated to admit the hand easily.

3. The pelvis must not be too contracted.

### 1. Decapitation.

**Instruments.**—(a) Ramsbotham's or Jardine's sharp hook (Fig 143). Jardine's is a most satisfactory instrument, the hook being smaller and less curved than Ramsbotham's.

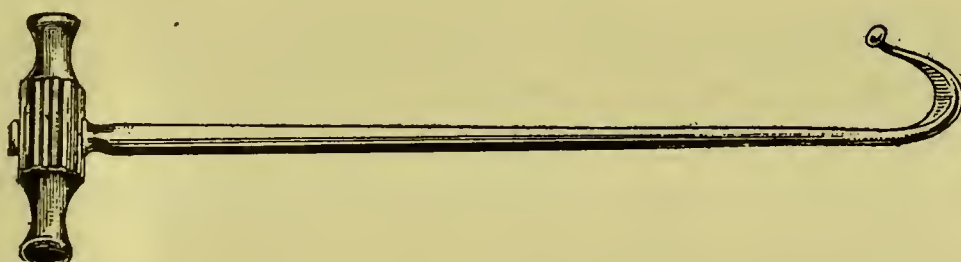


FIG. 143.—JARDINE'S DECAPITATING SHARP HOOK.

(b) Braun's blunt hook. This is a favourite instrument in Germany, but is not to be compared with the sharp hook for simplicity and speed in decapitating.

(c) A special instrument has been devised for applying and working Gigli's wire saw, but has no special advantage over the sharp hook.

(d) Large strong scissors may be used in the absence of a hook, but are more dangerous and difficult to work.



**Operation.**—The patient is placed in the dorsal position and deeply anaesthetized.

The bowel and bladder must be empty, and thorough aseptic and antiseptic precautions are carried out as already described for other operations.

Introduce the whole hand into the uterus and hook the fingers over the neck from behind, the thumb lying to the front (Fig. 144). Then pass the hook from the front and fix it on the neck so that the point of the instrument lies under the fingers, taking care not to cut the fingers with the knife edge when the sharp hook is used.

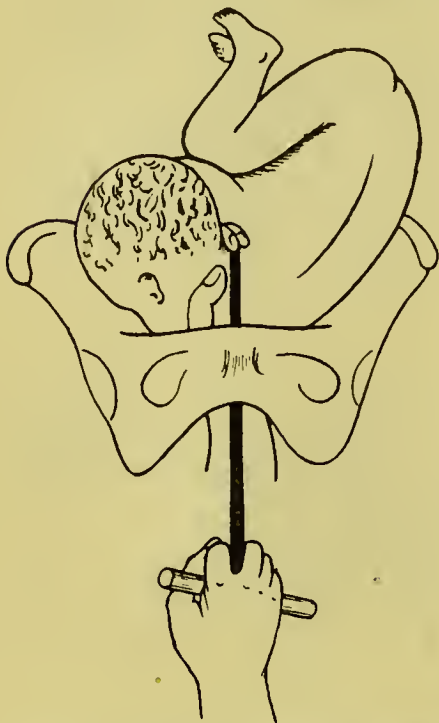


FIG. 144. —DECAPITATION WITH THE SHARP HOOK FOR AN IMPACTED SHOULDER PRESENTATION.

(a) *Sharp Hook.*—Pull the hook steadily downwards with a slight sawing movement till the neck is completely severed. Note the progress with the fingers, and be cautious as the final portion is being cut to prevent the instrument coming through too suddenly, with the risk of injuring your hand or the maternal passages.

(b) *Blunt Hook.*—Pull down the hook and twist it at the same time so as to tear through the tissues. When it becomes hooked over the cervical vertebrae twist it so as to dislocate the bones backwards. The twisting and pulling movement is continued till the head is severed.

*Extraction.*—An arm is pulled down and used to deliver the trunk. The head is then delivered by expression from above by the forceps or cranioclast.

## 2. Evisceration and Spondylotomy.

This is necessary where the neck cannot be reached to perform decapitation.

The thorax is opened by cutting through the ribs with strong scissors or a perforator, an opening being made large enough to remove the viscera piecemeal. This does not get over the difficulty of the rigid spine, so it is necessary to perform spondylotomy by cutting through the vertebral

column with bone forceps or special scissors, or by dislocating the spine with the blunt hook.

The foetus can now double up so that the legs can be pulled down and delivery effected by extraction.

### 3. Cleidotomy.

This operation is necessary when the bisacromial diameter is so great as to obstruct labour. The clavicles are cut across by strong scissors or fractured by the perforator.

## XII. Caesarean Section.

**Definition.**—This is the operation by which the child is extracted through an incision in the abdominal and uterine walls.

There are three varieties of this operation.

1. Simple or conservative caesarean section or laparo-hysterotomy. The uterus is sutured and preserved after the child has been extracted through an incision in the upper uterine segment.

2. Porro's operation or caesarean hysterectomy. The uterus is removed by subtotal or total hysterectomy after the child has been extracted as above.

3.—Supra-pubic or extra-peritoneal caesarean section. The child is removed through an incision in the lower uterine segment, which is reached by a transverse abdominal incision above the symphysis pubis.

Vaginal hysterotomy or vaginal caesarean section is not done for deformed pelvis, and has already been described under "Dilatation of the Cervix" (p. 343).

### 1. Simple or Conservative Caesarean Section.

**Synonyms.**—Caesarean hysterotomy. Laparo-hysterotomy.

**Definition.**—The child is extracted through a longitudinal incision in the abdominal wall and the upper uterine segment in the middle line. The uterus may also be opened by a transverse fundal incision, though this method has been now abandoned by most operators.

**Indications.**—(a) *Absolute.*—1. Deformed pelvis below  $2\frac{1}{2}$  inches.



2. Tumours of the bony pelvis completely obstructing labour.

3. Impacted solid or immovable ovarian tumours.

4. Certain cases of accidental haemorrhage, especially the concealed variety with a closed and rigid cervix.

5. Grave cases of eclampsia with rigid and closed cervix. Vaginal hysterotomy is also performed for this condition.

6. Central placenta praevia with closed cervix, if the interests of the child are of great importance.

7. Anterior sacculation of the uterus and displacement of cervix due to a previous ventro-fixation.

8. Death of the mother—post-mortem caesarean section—if the operation can be completed within five minutes.

(b) *Relative*.—When the mother is willing to run the risk of operation to get a living child, although craniotomy would do, as in medium degrees of pelvic deformity from  $2\frac{1}{2}$  to 3 inches.

In such cases operation is only justifiable if performed under favourable conditions and with previous preparation as for any other laparotomy. The maternal mortality of caesarean section performed late in the first stage of labour is too great to justify this operation for the sake of the child alone.

**Contra-indications.**—(a) *Where Craniotomy is possible*.—If craniotomy can effect delivery caesarean section is not justified in the following conditions:

1. Where the patient is probably infected by previous repeated vaginal examinations or futile attempts at delivery by forceps.

2. Where the patient is already exhausted by prolonged labour or is in poor condition or is already infected.

3. Where the surroundings prevent an aseptic operation.

(b) *Caesarean Section is imperative*.—If section must be done under the above conditions the uterus should be removed by hysterectomy.

**Prognosis.**—The risks are shock, haemorrhage and especially sepsis.

The prognosis is most favourable when operation is performed before labour or at the onset of the first pains, and without previous vaginal examination. The mortality rises from 3 up to 12 per cent. of cases the later the operation is performed in the first stage of labour, and is very high in cases which

have been made septic by previous frequent vaginal examinations and ineffectual attempts at forceps delivery.

**The Time to Operate.**—Some surgeons prefer to wait till labour has begun and the os is partly dilated, since the presence of uterine contractions reduces the risk of post-partum haemorrhage and the dilated cervix permits the free escape of the lochia. In such a case no previous vaginal examinations should be made.

Waiting till labour has begun before performing section is very suitable in hospital practice, where everything can be got ready at a moment's notice as for any emergency operation.

It is, however, not absolutely necessary to wait for the actual onset of labour pains with cases known beforehand and awaiting operation, so that a definite time can be fixed as near full-time pregnancy as can be calculated, the patient meantime being prepared for section as for any laparotomy.

**Preliminaries.**—(a) *Cases awaiting Operation.*—The patient should be carefully prepared as for any laparotomy as regards diet, regulation of the bowels, preparation of the skin and shaving of pubes. A bath is given the night before and the lower bowel is emptied by an enema six hours before operation. The bladder should be emptied by a catheter immediately before.

When the patient is on the operating table and anaesthetized, the whole abdomen is cleansed with ethereal soap solution and sterile water, followed by thorough scrubbing with alcoholic solution of mercury biniodide 1 in 500. This is the author's practice, but others may prefer different methods, such as painting with iodine. The author has entirely abandoned a preliminary cleansing two days before operation, followed by the application of a sterile dressing, and only disinfects the skin after the patient is on the operating table, with better results as regards primary wound healing. The vagina is disinfected by the same solutions. The field of operation is entirely surrounded by sterile towels, while operator and assistants wear rubber gloves, sterile gowns, sleeves and masks covering the head and face, and leaving only a space to see through.

(b) *Emergency Operation.*—There may only be time to disinfect the vagina and abdomen, shave the pubes and empty the bladder by a catheter, but if at all possible, the patient should get a full



bath, and the lower bowel be emptied by an enema. The other precautions are the same as those mentioned above.

Before commencing the operation, the presentation and position of the foetus should be noted, as it must be extracted by seizing a head or leg.

Chloroform is the best anaesthetic, but some prefer ether.

**Operation.**—1. Make a longitudinal incision in the linea alba, six inches long, and beginning three inches above the pubes, to avoid the bladder and lower uterine segment. The peritoneum is carefully opened between two pairs of forceps and then cut with scissors the entire length of the wound.

2. The assistant now presses the uterus into the wound. The insertions of the Fallopian tubes at the junction of the upper and middle thirds of the uterus are looked for to indicate by their position how much the uterus is rotated. This rotation is corrected as the uterine incision must be made in the middle line.

3. Place large sterile lint or gauze swabs round the uterus and projecting over the edges of the abdominal wound, in order to prevent blood or liquor amnii getting into the peritoneal cavity.

4. Cameron lays a special compression pessary on the uterus to arrest haemorrhage when cutting.

5. Incise the uterus in the middle line (within the pessary if one is used) for five or six inches, keeping above the retraction ring. Cut rapidly but carefully till the shining membranes are seen, then, without injuring the membranes, complete the uterine incision with a probe-pointed bistoury or scissors, using either the finger or a director as a guide.

Should the placenta be in the way, cut through it as far as the amnion, which leave intact. Some advise stripping off the placenta at one side till the membranes are reached.

6. The incision being completed (remove the pessary), rupture the membranes, plunge in the hand, seize the foetus by the head or legs, and extract quickly before the uterus has time to retract.

7. Hand the child to a special assistant, who clamps the cord with forceps, cuts it, and takes the child away.

While this is being done, the assistant presses the abdominal wall on each side against the uterus to prevent fluids and blood getting into the peritoneal cavity.

8. Remove the placenta and membranes and swab the uterine cavity. As soon as this is done, the assistant places a large gauze or lint swab behind the uterus, which he then presses out of the abdominal wound.

9. Now fold the uterus in a warm sterile towel, leaving only the anterior surface and wound exposed.

10. The assistant grasps the uterus with fingers and thumbs just outside the edge of the wound. This controls the haemorrhage and everts the wound to facilitate suturing.

11. Close the uterine wound by passing interrupted chromicized catgut sutures one-third inch apart. The needle enters about one quarter inch from the edge of the wound and includes the peritoneum and whole thickness of the muscle, but avoids the decidua. Pass all these deep sutures before tying them, and if there is any bleeding pass more sutures till it stops.

Lastly, pass interrupted sutures or a continuous catgut Lembert suture to accurately approximate the peritoneal edges.

12. If it is desired to sterilize the patient against future pregnancy, cut the tubes close to the uterus and suture the wound.

13. If the uterus is soft and flabby wrap it in a warm towel and gently massage it. At the same time a hypodermic of ergot is given.

If the uterus keep atonic and haemorrhage continues, try Neu's injection of 1 in 10,000 adrenalin solution. Inject ℥xv into several places of the uterine wall, about half an inch from the wound margin.

14. When the uterus is well retracted, return it into the abdomen and remove all swabs.

15. Close the abdominal wound in layers, using continuous catgut sutures for the peritoneum and fascia respectively, and interrupted silk-worm gut sutures for the skin and fat. Apply sterile gauze and gamgee over the wound, and keep in place by a broad supporting flannel binder.

**After-treatment.**—An injection of ergot is given as soon as the operation is completed if this has not been previously done, and the patient should be carefully watched for post-partum haemorrhage. The rules as regard diet, movement of bowels and nursing, are those for abdominal section in general. The stitches are removed on the tenth day, and the patient can rise



during the third week. An abdominal belt may be worn afterwards, but is not necessary if the wound has been properly sutured.

If all goes well, the mother may nurse her child.

## 2. Caesarean Hysterectomy or Porro's Operation.

**Definition.**—The child is extracted through a longitudinal incision in the abdominal and uterine walls, followed by a supra-vaginal amputation of the uterus, and, in certain cases, by total hysterectomy.

**Indications.**—1. Atresia vaginae.

1. Cancer of the vagina or cervix uteri.

3. Fibroids of the uterus.

4. Septic uterus after prolonged labour.

5. Uncontrollable haemorrhage after caesarean section.

6. Some cases of ruptured uterus.

7. Osteo-malacic pelvis. Some prefer to retain the uterus and only remove the ovaries.

8. Dead and putrid child, the uterus being thus infected.

**Operation.**—The abdominal incision is carried down nearer the pubes, and all the steps of the operation for simple caesarean section are carried out as above, to the turning out of the uterus but without removal of the placenta. The uterus is then amputated supra-vaginally in the same manner as in hysterectomy for fibroids followed by peritonization of the stump and all raw surfaces. If done for rupture of the uterus, the pelvis is drained per vaginam.

One or both ovaries should be preserved, except in cases done for osteo-malacia.

Total hysterectomy is to be preferred for operable cases of cancer of the cervix or if the uterus is infected, the pelvic cavity being drained through the vaginal opening.

In the original Porro's operation an elastic ligature or *serre nœud* was placed round the uterus below the line of amputation, the stump being sutured into the lower angle of the abdominal wound and allowed to slough off.

## 3. Supra-pubic or Extra-peritoneal Caesarean Section.

**Definition.**—The child is extracted through a transverse incision in the abdominal wall and a longitudinal incision in the lower uterine segment.

**Indications.**—Cases showing symptoms of infection. It has also been done for placenta praevia.

**Operation.**—The abdominal wall is opened by a Pfannenstiel's transverse incision, 6 ins. long, above the symphysis pubis. The fascia is divided and the recti muscles drawn apart with wound retractors. The lower uterine segment is then exposed by stripping the peritoneum off the bladder with gauze down to the utero-vesical fold, the bladder being separated from the cervix. Should the peritoneum be accidentally opened in places, it is now sutured.

The uterus is opened by a longitudinal mesial incision through the lower uterine segment, through which the child, placenta and membranes are extracted. The uterus is sutured and the wound closed, but in septic cases drainage of the wound is necessary.

It is better to operate after the cervix is dilated, but with the membranes intact, as the lower uterine segment is well formed, the anterior cervical wall is drawn up and the utero-vesical fold is more easily displaced.

There are now various modifications of this operation, but it is doubtful if it will come into general favour with surgeons.

**Prognosis.**—In 150 recorded cases eight died of sepsis. The operation is thus dangerous if the parturient canal is infected, and should not be done in such cases if craniotomy is possible.

### XIII. Operations for Widening the Bony Pelvis.

1. **Symphysiotomy.**—Division of the symphysis pubis with a knife.

2. **Pubiotomy.**—Division of the left pubic bone with Gigli's saw.

Both operations require the services of a skilled surgeon, and are only suited for hospital practice.

The mortality is high, the injuries are frequent and severe, and many of the children are lost, so the general practitioner who has to rely on his own resources will still prefer craniotomy or induction of premature labour.

**Indications.**—Flat pelvis not below  $2\frac{3}{4}$  ins.; justo-minor pelvis not below 3 ins.



Most operators prefer not to operate below 3 ins., the best results being obtained when the pelvis requires to be just a little larger to permit the passage of the head.

### 1. Symphysiotomy.

The symphysis pubis is divided, and the two innominates separate, thus enlarging the bony canal. The divided ends can separate  $1\frac{1}{2}$  to  $2\frac{1}{2}$  ins. without imperilling the sacro-iliac joints. The transverse and oblique diameters are increased, and the conjugata vera enlarges up to  $\frac{1}{2}$  in., the increase being one-fifth inch for each inch of gaping.

**Prognosis.**—The *Risks* are :

1. Injury to the bladder and urethra.
2. Severe laceration of the soft parts.
3. Injury to the sacro-iliac joints.
4. Severe haemorrhage.
5. Sepsis of the wound.

**Mortality.**—The operation is not free from grave danger, as the maternal mortality is as high as 9 per cent. and the foetal mortality 15 per cent.

**Preliminaries.**—Shave the pubes; empty the bladder and bowel; thoroughly disinfect the surrounding parts. The child must be alive and the cervix *fully* dilated. Place the patient in the dorsal position, with the nates at the edge of the table. The thighs are flexed and somewhat everted, and held by assistants, with one hand round the leg and the other hand holding the trochanter region.

(a) **Open or Italian Method.**—A longitudinal incision is made 3 cms. long in the median line, extending from above the clitoris to 1 or 3 cms. above the symphysis pubis. Separate the tissues, check haemorrhage, then pass the left index finger close behind the symphysis down to its lower edge. An assistant places a metal catheter in the urethra, which he presses downwards to the right. A sickle-shaped knife, guided by the left finger, is passed behind to the lower edge of the symphysis, which is cut by pulling the knife upwards and forwards by a rocking movement. If the subpubic ligament is missed, pass a smaller hooked knife and cut it. The pubic bones spring apart as soon as division is complete, so the assistants must press on the trochanters to prevent excessive separation.

Haemorrhage is often alarming, and is checked by packing the wound with sterile gauze.

The case is now left to nature, or forceps are used if speedy delivery is necessary for the sake of the child.

After delivery is completed, suture any injuries to the soft parts. Then bring the knees together, partly extend the thighs, withdraw all packing from the wound, and pass the finger behind the symphysis to see that the bladder is not caught. Finally, sew up the wound with deep and superficial sutures of strong silkworm gut, apply sterile dressings and fix by a broad linen binder applied round the pelvis to support it.

**After-treatment.**—The patient lies on a hard, even mattress or in a hammock bed, and the bladder is regularly emptied by catheter. The sutures are removed in  $2\frac{1}{2}$  weeks, and the patient may rise after 3 weeks, but should wear a pelvic bandage for several weeks.

(b) **Ayre's Subcutaneous Method.**—Make a small incision about 1 cm. below the clitoris. The left index finger is placed in the vagina as high as the upper border of the symphysis. A curved probe-pointed bistoury is then passed through the wound *close* against the front of the joint to the top of the symphysis, and thus lies under the vessels of the clitoris. The tip of the finger in the vagina feels the tip of the bistoury at the top of the joint. The bistoury is now worked downwards to sever the joint, the vaginal finger accompanying it to within  $\frac{1}{2}$  cm. of the pubic arch. The bistoury is then withdrawn, inverted, re-inserted, and made to cut upwards, thus avoiding the pars intermedia of the vestibular bulbs. A sound is kept in the urethra to displace it to the right, to avoid injury. When the knife is removed after completing division of the joint, sterile gauze is pressed against the wound till after the birth of the child, in order to prevent haemorrhage and infection.

(c) *Herman* uses a tenotomy knife to sever the joint, and cuts from below upwards.

## 2. Pubiotomy.

**Synonyms.**—Hebotomy. Hebosteotomy.

The pubic bone is divided a finger's breadth from the symphysis. The divided ends can separate up to 7 cms.



( $2\frac{3}{4}$  ins.). A separation of 3 cms. increases the conjugata vera 1 cm.; of 6 cms. nearly 2 cms.

**Prognosis.**—The maternal mortality is about 5 per cent., and the foetal mortality nearly 10 per cent.

The morbidity rate is very high, the following occurring in 510 cases :

Severe haemorrhage from the wound, -	78 cases.
Haematoma, - - - -	87 „
Lacerations into the vagina, - -	79 „
Simple tears of soft parts, - -	91 „
Injury to the bladder, - - -	63 „
Thrombo-phlebitis, - - - -	42 „
Febrile puerperium, - - - -	162 „

The after-effects in 120 women examined later were :

Vaginal prolapse, - - - -	29 cases.
Hernia in wound, - - - -	9 „
Continued incontinence of urine, - -	5 „

Many had difficulty in walking.

(a) *Döderlein's Method.*—The child must be alive and vigorous, and the cervix dilated. When labour starts, place

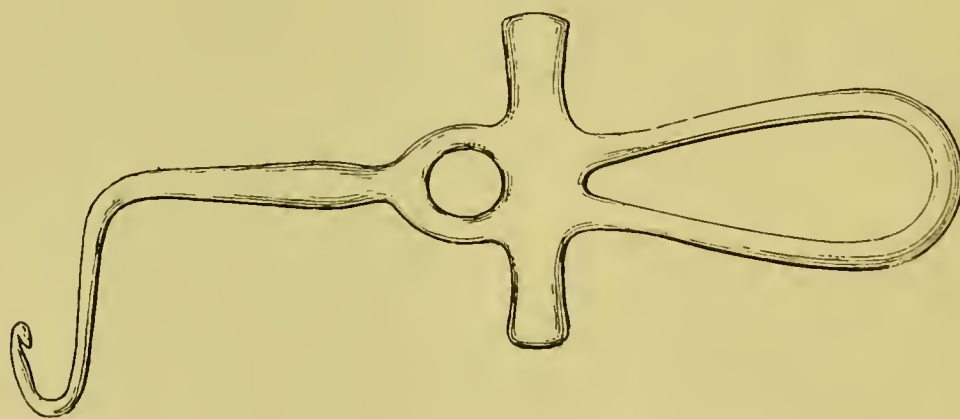


FIG. 145.—DÖDERLEIN'S PUBIOTOMY NEEDLE.

a colpeurynter in the vagina to dilate the soft parts and support the membranes. When the cervix is fully dilated, remove the bag and rupture the membranes. Empty the bladder. The patient lies in the cross-bed position, with her sacrum resting on the edge of the bed. Make a transverse incision, large enough to admit the finger, over and down to the upper edge of the left os pubis between the symphysis and the tubercle. Insert the finger and push the tissues away from the back of the bone, to avoid injury to the bladder.

Under guidance of a finger in the vagina, pass Döderlein's pubiotomy needle (Fig. 145) through the incision, and keep close to the back of the bone at a distance of one finger's breadth from the symphysis. An assistant pulls the clitoris and labia well to the right, so that the point of the needle projects under the skin well out on the left labium majus. A small incision sets the point free. Attach a Gigli's saw (Fig. 146) to the end of the needle, and draw it back through the incision above. Bring the legs of the patient rather close together, assistants pressing on each side of the pelvis to keep the bones from springing suddenly apart when divided. Now saw through the bone, and when completed withdraw the saw. Bleeding may be profuse, and must be stopped by

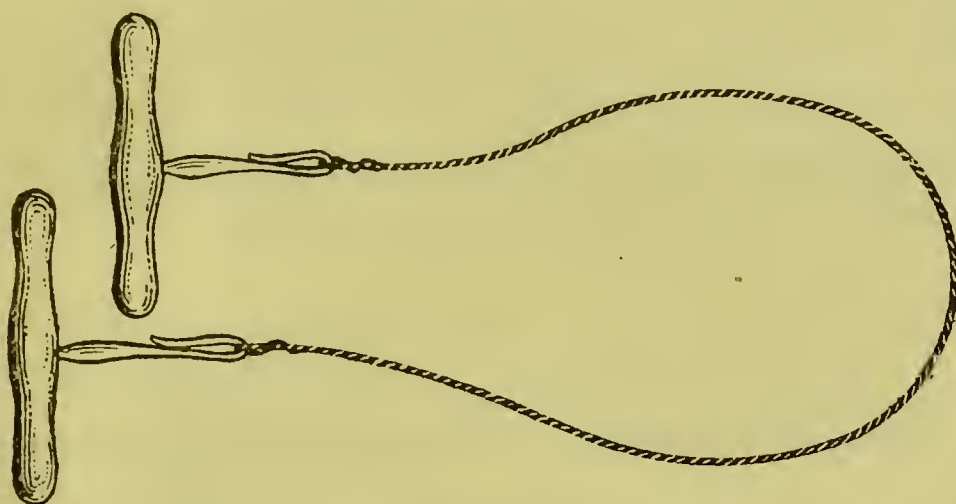


FIG. 146.—GIGLI'S THREAD SAW.

compression. Now put the patient in the hanging-leg position, with her legs apart, when the bones will separate. Suture the wounds if delivery is left to nature. Use forceps if required, in which case suture the wounds afterwards while waiting for separation of the placenta. After the placenta is born, plug the vagina with sterile gauze, and apply firm compresses over wounds and vulva to prevent a haematoma forming. Remove the compress in eight hours. Apply adhesive plaster and a tight binder round the pelvis.

**After-treatment.**—The patient is kept lying on her back for twelve days, but can rise on the fourteenth day and walk two days later.

(b) *Bumm's Subcutaneous Method.*—Under guidance of a hand in the vagina, push Bumm's needle through the skin at the lower edge of the left pubic bone, and pass it up behind the bone, under the periosteum if possible, till the point



reaches the skin above the pubic bone just to the outer side of the tubercle.

A small incision sets the point of the needle free, and to this a Gigli's saw is attached and drawn backwards through the wound. The saw now lies behind the bone, and is worked backwards and forwards till the bone is severed and gapes enough, recognized by vaginal examination, when the saw is withdrawn. Gauze compresses are at once applied to the subcutaneous wound from the side of the vagina as well as outside, in order to check venous bleeding and the production of a haematoma.

If possible, leave the case to nature and await spontaneous delivery; but if the child show signs of asphyxia, deliver by forceps or perform version.

After the child is born and also after the birth of the placenta, re-tampon the vagina and compress the wound.

**After-treatment.**—The vaginal tampon is not removed for 24 or 36 hours. The catheter should be used for the first 48 hours.

#### XIV. Manual Separation of the Placenta.

This operation should only be done when absolutely necessary, as the risk of introducing sepsis is very great, owing to the fingers manipulating on the placental site with its open blood vessels.

**Indications.**—1. Dangerous haemorrhage or retention of the placenta in atony of the uterus when other means fail.

2. Adherent placenta, with or without haemorrhage.

3. Placenta incarcerated in hour-glass contraction.

4. Haemorrhage in placenta praevia.

5. Retained portion of a placenta succenturiata.

**Method.**—Place the patient in the dorsal position and anaesthetize with chloroform, or, if anaemic, with ether.

Carry out the most rigid antiseptic cleansing of vulva, vagina, hands and arms up to the elbow, and wear boiled rubber gloves.

Steady the uterus with one hand over the fundus, and pass the other hand into the uterus, going outside the membranes. Loosen the placenta by a sawing movement of the finger tips,

keeping the back of the hand towards the uterine wall (Fig. 147). After the placenta is separated, do *not* pull it out, but *expel* it only by *expression* from above. Examine to see

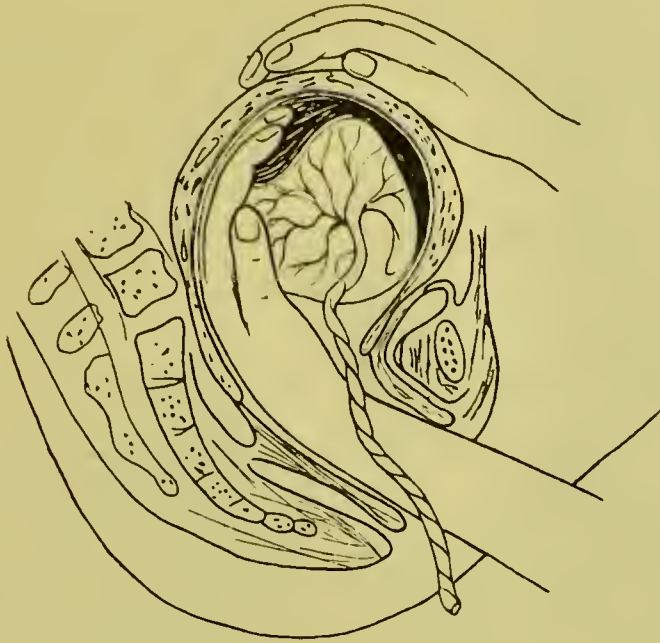


FIG. 147.—METHOD OF SEPARATING AN ADHERENT PLACENTA.

A sterile rubber glove should be worn.

that no portions of placenta are left behind, and, if so, remove them as far as possible with the fingers.

Finally, thoroughly douche the uterine cavity with a 1 per cent. lysol solution at 115° F.



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